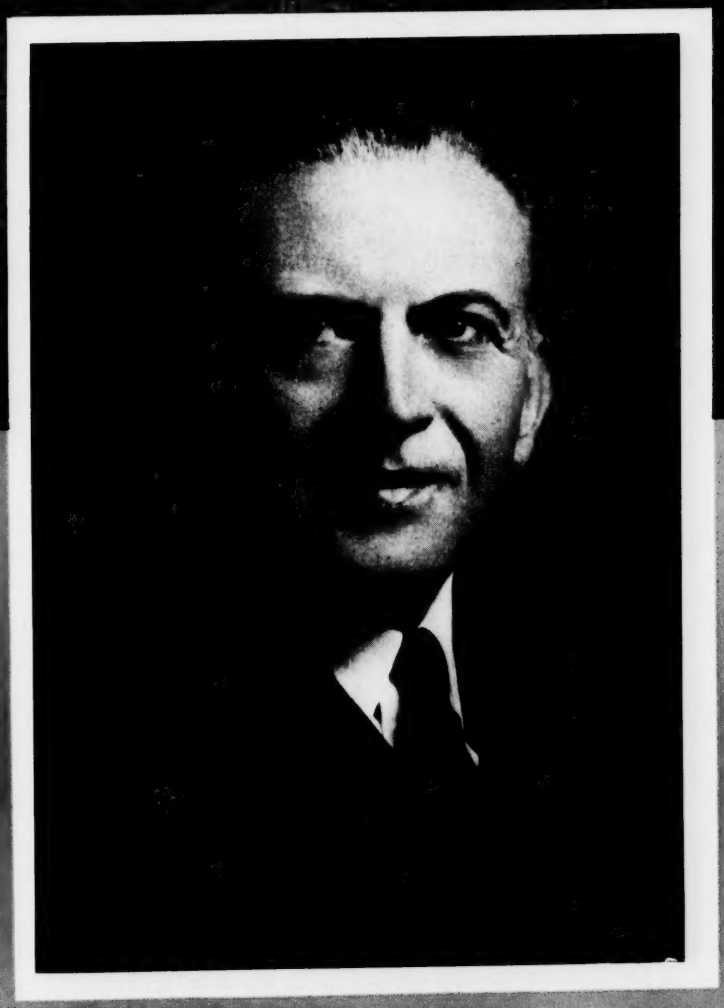
Metals Review

July 1958



E. C. Bain
Past President A.S.M.
(See Article, p. 4)

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Metals Review

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E. C. Bain, U. S. Steel Corp., Delivers Tenth Annual Andrew Carnegie Lecture

E. C. Bain, past national president A.S.M. (1937), and retired assistant executive vice-president, U. S. Steel Corp., demonstrated to the **Pittsburgh Chapter** that if retirement from active duties constitutes the twilight of one's career, his twilight will be so brilliant that instead of casting lengthening shadows, it will create lasting impressions on the minds of those engaged in the science of metallurgy.

In a talk entitled "The Growth of Metallurgical Science—in Retrospect and Prospect" Dr. Bain led a captivated audience, gathered in the memory of Andrew Carnegie, through the history of metallurgical science from the pre-Christian era up to the present. Using this history as a background, Dr. Bain admonished the audience that the leadership in metallurgical science assumed by the United States within the last 15 years can only be maintained by hard work, dedication to a job and self-discipline.

Metallurgical science, according to Dr. Bain, particularly with respect to the science of the manufacture of iron and steel, began in about 1350 B.C., which is the approximate date of the first use of iron implements. In all probability, the evolution of iron up to this point arose from the need of better instruments and for better weapons. Of course, stone implements and weapons would not hold a good cutting edge and thus were replaced by metals such as copper and brass, but even these were too soft, and with the first use of iron in 1350 B.C., a new era was born.

With the equipment available to man at that time, the winning of iron from its ore was not easy. Indeed it is remarkable that such good quality was obtained with the crude equipment available. Some idea can be gained from the difficulties involved because even today certain tribes in Africa produce iron by methods not too unlike those used by man in the early pre-Christian era.

Man early recognized two general classes of iron. One was soft and malleable (low carbon, although this was not recognized), while the other was hard and not malleable (high carbon). The two desirable characteristics of each form were used to advantage by interleaving pieces of the hard and nonmalleable iron between pieces of the soft and malleable iron for interdiffusion. This composite was forged, folded, forged and refolded, until many layers were formed and laminated articles consisting of layers of originally soft and hard iron resulted. Dr. Bain showed his audience a knife made in Japan by this lamination technique and explained that the knife blade itself probably consisted of thousands of layers of the high and low carbon (hard and soft) types of iron.

Although crude blast furnaces and cast iron works were in operation in China in the second century, the earliest of what might be called metallurgical writings did not appear until the 17th and 18th centuries. Moreover, even these writings demonstrated that the chemistry of the making of iron and steel was not completely understood.

This understanding began with the work of the British scientist Boyle and was enlarged by work of French scientists, who recognized the importance of certain impurities. Their work came in the early part of the 19th Century.

The 19th Century also saw the beginning of mechanical testing to determine the properties of iron and steel, the development of the crucible melting process, the development of the wrought iron (puddle ball) process, which was pushed by the demand for rails in the United States. The first Transcontinental Railroad had wrought iron rails. More important was the concurrent development by Bessemer and Kelly of the pneumatic steelmaking practice, and the improvement of the steel made by this practice. This improvement was made possible by the discovery of the beneficial effects of manganese (patented in 1856).

The all-important science of metallography began with Sorbey in 1863, and, to some extent, remained as a capricious art until rationalized by Viellia in the 1920's and 1930's.

The Siemans-Martin development of the openhearth steelmaking process in 1865 opened an era for scrap consumption and large-scale production of high-quality product and paved the way for the rapid and spectacular developments of the 20th Century. Dr. Bain specifically cited the development of the continuous annealing practice for sheet and strip, the continuous tinning lines, and the growth of fundamental and applied research which resulted in products such as plastic coated steels and vacuum casting techniques (the early work on which was performed by Rohn in Germany).

Dr. Bain urged his audience not to be complacent with these remarkable developments because today an important and serious challenge faces the United States and the rest of the free world. This challenge lies in the fact that we have no monopoly on learning, and our rivals, the Soviets, have made such remarkable strides within the past decade that unless we throw aside our complacency they will outstrip us not only in productivity but also in research. Dr. Bain expressed confidence that we know which of our aspects are good and that these can be exploited. He begged that we recognize that we cannot rival the Soviets in number of people or in amounts of raw materials, but we can concentrate on the qualities, particularly those inherent in our human product.

Speaking to present and to future metallurgists, Dr. Bain stated that

Dr. Bain (Center), Is Shown as He Received a Certificate Commemorating the Tenth Annual Andrew Carnegie Lecture He Delivered Before the Pittsburgh Chapter. Chairman Lester C. Hill is shown at left, J. B. Austin, technical chairman and past president A.S.M., is shown at the right

Dr. Bain (continued)

the supremacy of the United States and the free world in metallurgy resides largely in their self sacrifice in dedicating themselves to their job, applying self discipline to concentrating on the solution of the problems at hand, and hard work to achieve the results.

To research workers and particularly to present and future directors of research, he warned not to be misled by the Soviet developments, not to over-emphasize fundamental research, but rather, balance it nicely with applied research that will yield immediate results. Even in fundamental research, which is necessary, Dr. Bain urged that aimless research be not over-encouraged. He strongly recommended that research programs be planned on the basis of a running theory, and that critical experiments be conducted to prove or disprove this ever-improving theory. The results of such programs will, in the long run, be immensely more fruitful than may be the abstract results of rambling without the will to learn deeply in a definite field.

Certainly these words are not the idle chatter of an over-sensitive alarmist, but represent the wisdom of a person who has made a great contribution to the position of metallurgical science in the United States. —**Reported by J. J. Heger for Pittsburgh.**

♦ ♦ ♦

Dr. Bain graduated from Ohio State University in 1912, and did graduate work at Ohio State and Columbia Universities. He taught at the University of Wisconsin, and worked successively for the B. F. Goodrich Rubber Co., National Lamp Works of the General Electric Co., Atlas Steel Corp. and Union Carbide and Carbon Research Laboratories.

He joined United States Steel in 1928 and remained with them until he retired as assistant executive vice-president in September 1957.

Dr. Bain has received a large number of medals for his work in metallurgy, including the Hunt Medal, the Howe Medal, the Albert Sauveur Achievement Award, the John Price Wetherill Medal and the Gold Medal of the American Society for Metals.

His work on transformations in steel resulted in "Bainite", named in honor of its discoverer. He is a member of many learned societies, has been author of some 40 technical papers and several books; has traveled all over the world, lecturing and visiting steel industries.

He was further honored when one of the major buildings at U. S. Steel's Research Center in Monroeville, Pa., was named the Edgar C. Bain Laboratory for Fundamental Research.

Discusses Quality Control Techniques

H. F. Gammons, Chief Steel Works Metallurgist, National Tube Division, U. S. Steel Corp., Gave a Talk on "Metallurgical Quality Control" at a Meeting in Milwaukee. Mr. Gammons, center, is shown with Bob Huseby, left, technical chairman, and Marv Evans, chapter chairman, on the right

Speaker: H. F. Gammons
National Tube Division
U. S. Steel Corp.

H. F. Gammons, chief steel works metallurgist, National Tube Division, U. S. Steel Corp., presented a talk on "Metallurgical Quality Control" at a recent meeting in **Milwaukee.**

Mr. Gammons talk was primarily concerned with quality control in the manufacture of tubular products made from steel; however, he pointed out that similar quality control methods can be applied in basic industry generally. The objectives outlined for quality control work included improvement of quality and decreasing rejections and costs. Effective quality control procedures include not only the use of control charts in conjunction with sampling procedures but at least three supplementary statistical procedures: correlation analysis, experimental evaluation and testing for significance.

The statistical quality control activity is subdivided into three main functions: The first is in the area of process control and involves routine procedures to obtain data for control charts indicating the level of control, process variables, and level of rejections. The second quality control function, "process investigation", consists of analyzing data to establish upper and lower control limits for inspection and to determine the cause of abnormal departures from the established limits. The third function aids in evaluation of new processes, new materials and new products. Various statistical techniques of correlation analysis, significance tests and analysis of variance are employed in this phase of responsibility.

An application of statistical methods in studying the variation in heats of steel to determine the level of ladle chemistry versus formed steel pipe chemistry was demonstrated with slides showing observed data and calculated frequency distribution curves. A comparison of these curves indicated the degree of control that was maintained in ladle chemistry and its effect on pipe chemistry.

Another application described for statistical quality control in pipe manufacture is in the inspection of semifinished round billets. This operation requires close attention to quality due to costs involved in further conditioning or rejection of the material. In a statistical analysis of this problem, 31 random variables were examined for effect on rejections. The "index of rejects" and linear regression coefficients were developed for each variable and used to specify control limits for these process variables.

An effective quality control program requires extensive knowledge of process variables in conjunction with knowledge of the application of statistical methods.—**Reported by J. D. Sullivan for Milwaukee Chapter.**

SNT Proceedings

A limited number of the March-April 1958 issue of the *Journal of the Society for Nondestructive Testing,* which contains the complete Proceedings of the Second International Conference on Nondestructive Testing held Nov. 3-8, 1957, is available through Philip D. Johnson, Editor, 1109 Hinman Ave., Evanston, Ill. Cost of the Journal is $2.

1958 Preprint List

Papers for Presentation at the National Metal Congress Cleveland, Oct. 27-31, 1958

All of the following papers will be preprinted for distribution to members of the American Society for Metals upon request. The Society will print only 10% in excess of the number of orders for preprints in the office on press date, and this excess 10% will be sent out as long as it lasts. Order the preprints by their numbers before Sept. 1, 1958.

Preprints No. 81, 83, 88, 97, 100 and 114 (marked by asterisks) are for publication only in Transactions, all of the other papers listed will be presented at the National Metal Congress. All of the papers listed will be included in vol. 51 (1958) of Transactions.

81.* **The Aluminum-Rich End of the Aluminum-Vanadium System,** by D. M. Bailey, O. N. Carlson and J. F. Smith, Ames Laboratory, Ames, Iowa.

82. **Preparation of FeO, NiO and CoO Crystals by Halide Decomposition,** by R. E. Cech and E. I. Alessandrini, General Electric Research Laboratory, Schenectady, N. Y.

83.* **Lattice Parameters of Uranium From 25 to 1132° C.,** by P. Chiotti, H. H. Klepfer and R. W. White, Ames Laboratory, Ames, Iowa.

84. **The Mechanical Properties and Heat Treatment Response of Zirconium-Uranium Alloys,** by W. Chubb and F. A. Rough, Battelle Memorial Institute, Columbus, Ohio.

85. **Diffusion Layer Formation in the Ternary System Aluminum-Magnesium-Zinc,** by J. B. Clark, Dow Chemical Co., Midland, Mich., and F. N. Rhines, Carnegie Institute of Technology, Pittsburgh, Pa.

86. **Hydrogen Embrittlement and Delayed Failure in Titanium Alloys,** by R. D. Daniels, University of Oklahoma, Norman, and R. J. Quigg and A. R. Troiano, Case Institute of Technology, Cleveland, Ohio.

87. **Some Low-Temperature Observations of 1020 Steel,** by F. S. Deronja and M. Gensamer, Columbia University, New York, N. Y.

88.* **The Constitution of Rhenium-Tungsten Alloys,** by J. M. Dickinson and L. S. Richardson, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.

89. **The Mechanism of the Allotropic Transformation in High-Purity Iron,** by Erwin Eichen and J. W. Spretnak, Ohio State University, Columbus, Ohio.

90. **The Application of Rate Process Theory to the Heat Treatment of Titanium Alloys,** by N. M. Erkun, Crucible Steel Co. Research Laboratory, Midland, Pa.

91. **The Phenomenon of "Negative Creep" in Alloys,** by R. W. Fountain and M. Korchynsky, Electro Metallurgical Co., Niagara Falls, N. Y.

92. **The Effect of Stress on the Eutectoid Decomposition of Titanium-Chromium Alloys,** by A. W. Goldenstein, A. G. Metcalfe and W. Rostoker, Armour Research Foundation, Chicago, Ill.

93. **Austenite Transformation and Incubation in an Alloy Steel of Eutectoid Carbon Content,** by R. A. Grange, U. S. Steel Corp., Monroeville, Pa., and P. T. Kilhefner and T. P. Bittner, U. S. Steel Corp., Duquesne Works, Duquesne, Pa.

94. **The Effect of Heat Treatment on the Elevated Temperature Stress Stability of Titanium Alloys,** by M. L. Greenlee, G. A. Lenning, W. M. Parris and H. D. Kessler, Titanium Metals Corp. of America, Henderson, Nev.

95. **Effect of Strain Rate and Temperature on the Compressive Flow Stresses of Three Titanium Alloys,** by A. J. Griest, A. M. Sabroff and P. D. Frost, Battelle Memorial Institute, Columbus, Ohio.

96. **Prediction of Transition Temperature in a Notched Bar Impact Test,** by J. A. Hendrickson, California Research Corp., La Habra, Calif., and D. S. Wood and D. S. Clark, California Institute of Technology, Pasadena, Calif.

97.* **Progression of the Freezing Front and the Temperature Distribution in Ingots During Solidification,** by J. W. Hlinka and V. Paschkis, Heat and Mass Flow Analyzer Laboratory, Columbia University, New York, N. Y.

98. **The Effect of Composition on the Hydrogen Embrittlement of Alpha-Beta Titanium Alloys,** by R. I. Jaffee and D. N. Williams, Battelle Memorial Institute, Columbus, Ohio.

99. **Multiplying Factors for the Calculation of Hardenability of Hypereutectoid Steels Hardened From 1700° F.,** by C. F. Jatczak and D. J. Girardi, Timken Roller Bearing Co., Canton, Ohio.

100.* **Metallographic Identification of Inclusions in Uranium,** by G. L. Kehl, Eric Mendel, Emilio Jaraiz, Columbia University School of Mines, New York, N. Y., and Melvin H. Mueller, Argonne National Laboratory, Lemont, Ill.

101. **The Relationship Between Weld-Cracking and Alloy Constitution in Some Binary and Ternary Magnesium Alloys,** by C. L. Kobrin and R. A. Dodd, University of Pennsylvania, Philadelphia, Pa.

102. **A Simplified Procedure for Calculating Peak Position in X-Ray Residual Stress Measurements on Hardened Steel,** by D. P. Koistinen and R. E. Marburger, General Motors Research, Detroit, Mich.

103. **An X-Ray Metallographic Study of Arc-Cast Tungsten,** by Sam Leber, General Electric Co., Cleveland, Ohio.

104. **Stress Effects of Abrasive Tumbling,** by H. R. Letner, General Electric Co., Cleveland, Ohio.

105. **Thermal and Mechanical Fatigue of Nickel and Titanium,** by Harry Majors, Seattle University, Seattle, Wash.

106. **A Procedure for Application of Time Temperature Parameters to Accelerated Creep Rupture Testing,** by S. S. Manson, G. Succop and W. F. Brown, Jr., NACA Lewis Flight Propulsion Laboratory, Cleveland, Ohio.

107. **Transformation Kinetics of Beta Plutonium,** by R. D. Nelson, Hanford Atomic Products Operation, Richland, Wash.

108. **Recrystallization, Structure and Hardness of Low-Carbon Steels Containing Up to 1% Copper,** by R. L. Rickett and W. C. Leslie, Edgar C. Bain Laboratory, U. S. Steel Corp., Monroeville, Pa.

109. **Low-Temperature Embrittlement of Austenitic Cr-Mn-N-Fe Alloys,** by F. W. Schaller, Case Institute of Technology, Cleveland, Ohio, and V. F. Zackay, Ford Motor Co., Metallurgy Dept., Dearborn, Mich.

110. **Mechanical Properties of Deformed Metastable Austenitic Ultra High Strength Steel,** by D. J. Schmatz and V. F. Zackay, Ford Motor Co., Metallurgy Dept., Dearborn, Mich.

111. **Mechanical Properties of Fe-Al-Si Alloys at Room and Elevated Temperatures,** by D. J. Schmatz and V. F. Zackay, Ford Motor Co., Metallurgy Dept., Dearborn, Mich.

112. **A Compilation and Interpretation of Cyclic Strain Fatigue Tests on Metals,** by J. F. Tavernelli and L. F. Coffin, General Electric Research Laboratory, Schenectady, N. Y.

113. **The Effects of Microstructure and Heat Treatment on the Hydrogen Embrittlement of Alpha-Beta Titanium Alloys,** by D. N. Williams, F. R. Schwartzberg and R. I. Jaffee, Battelle Memorial Institute, Columbus, Ohio.

114.* **Effects of Cold Work and Quenching on the Magnetic Susceptibility of Ti-140 A,** by Y. L. Yao, Dept. of Mines and Technical Surveys, Ottawa, Ont., Canada.

115. **Properties of As-Cast and Heat Treated 2% Molybdenum-Uranium,** by E. G. Zukas, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.

116. **Solid State Diffusion and the Motion of Phase Boundaries,** by D. D. Van Horn, General Electric Co., Nela Park, Cleveland, Ohio.

Rochester Sponsors Open House

Harold Gibson, Student Member A.S.M., Is Shown Demonstrating to Part of the Audience Attending the Metallurgical Open House and Exhibit Sponsored by the Rochester Chapter Transformation Structures That Result Upon Heat Treatment. The meeting was held at the University of Rochester

Students, parents and teachers were invited to a Metallurgical Open House and Exhibit held by the **Rochester Chapter** at the University of Rochester to acquaint high-school students with the field of metallurgy and metallurgical engineering.

The A.S.M. film, How Metals Behave, started off the program. The response to the film was very good and many of the science teachers requested its use for showing to their classes.

The film was followed by an exhibit of tensile testing which caused quite a sensation when a 2 x 1 in. section of cold rolled steel "let go". X-ray films of various castings showed defects with an analogy to broken arms or legs, the hot rolling of steel was related to automobile fenders and followed by letting the students "feel" and "see" the heat of 2000° F. Induction melting and the hardening of steel were also illustrated.

The characters of "Chinese Script" from an aluminum alloy caused a great deal of comment in the metallographic section. Souvenir photomicrographs of annealed brass, pearlite and aluminum were given away.

Over 700 people saw the exhibit, the bulk of them being students. In one or two instances, entire science classes were allowed to attend. A.S.M. literaure was passed out to the guests. The Rochester Chapter maintained the exhibit on a private showing basis for the month of March so that all interested high-school students had an opportunity to see it.—**Reported by R. B. Barrow for Rochester Chapter.**

As an indication of the tremendous dissemination of engineering information, a compilation shows that in one year the A.S.M. collected, edited, published and distributed over *one hundred million pages* of metallurgical information.

Explains Fabrication Methods

L. E. Laux (Left), Martin Co., Who Spoke on "Sheet Metal Fabrication in the Aircraft Industry" at New Jersey, Is Shown With S. G. Lindstrom, Chairman

Speaker: L. E. Laux

Martin Co.

A talk on "Sheet Metal Fabrication in the Aircraft Industry", prepared by Adolph Vlcek, Jr., manager of manufacturing engineering and research for the Martin Co., was heard at a recent meeting of the **New Jersey Chapter.** The talk was delivered by L. E. Laux, chief of manufacturing research and development at Martin Co., because Mr. Vlcek was unable to come to New Jersey.

Mr. Laux explained that the low volume and short runs of sheet metal parts for aircraft have led to less expensive forming tools than are used in other industries. Stretch forming was one of the first departures from more costly methods. It is possible to stretch wrap large sheets, bent parts and extruded details.

The Guerin trapped rubber forming system was a significant cost saving advancement for press forming. The rubber, confined in a steel frame, serves as a portion of a tool such as the lower half of a conventional die. A sheet piece part and tool are impressed into the rubber. The rubber forces sheet metal around or into the tool.

The frequent need to remove wrinkles or seat offsets following "Guerin" type forming initiated the development of "Marform". This is the Guerin process with the addition of a hydraulically actuated pressure pad which controls the flow of material over the die. Marforming reduced hand effort for finishing by over 69% at the Martin Co.

Formed aluminum parts requiring heat treatment often warped excessively when solution heat treating was performed. This occurred in basket quenching. The warping was reduced considerably by "free fall" quenching. The work is hung on racks for solution heat treating. The racks have a mechanism which can drop the work off the rack, in a free fall, into the quenching tank.

The most recent development in sheet metal joining are adhesive bonding, brazing and "cold" welding. Fusion welded and riveted structures have been replaced to some extent by relatively simple, highly efficient and economically produced adhesive bonded honeycomb structures. Where operational temperatures are high, adhesive bonding is being replaced by brazed-type structures.

Mr. Laux indicated that the aircraft industry is expending more effort than ever before in manufacturing research and development. Revolutionary changes in processing methods will be required for new exotic sheet materials to be used in future craft.—**Reported by Arnold Klein for New Jersey Chapter.**

Talks on Honeycomb Brazing

Charles E. Rorick (Left), Convair, Spoke on "Stainless Steel Honeycomb Brazing" at a Meeting of the Oak Ridge Chapter. He is shown with G. M. Slaughter

Speaker: C. E. Rorick

Convair

At a joint meeting of the **Oak Ridge Chapter** and the Northeast Tennessee Section of the American Welding Society, Charles E. Rorick, Convair, spoke on "Stainless Steel Honeycomb Brazing".

The talk was prefaced by a short discussion of the problems to be met in high-speed aircraft. Among the problems mentioned were strength-to-weight ratio, high-temperature strength, aerodynamic heating and the trend toward aircraft weight increase. A solution to many of these problems is the use of honeycomb sandwich panels and Mr. Rorick gave a short history of the development of this type of structure, including the materials of construction and the brazing alloys. The material presently used in the honeycomb panels is 17-7PH stainless steel. Titanium alloys are under investigation for possible future use.

The manufacturing operations were shown in a series of slides with emphasis on in-process quality control. Some of the operations described were honeycomb core milling, detail part fabrication, assembly of components by resistance tack welding, furnace brazing and heat treatment. This same slide series covered the evaluation of the internal quality of the honeycomb construction by X-ray and heat flash testing.

Mr. Rorick stressed the weight advantage of honeycomb construction, a saving of approximately 500 lb. per plane, over spot-welded plate and stringer construction. This weight saving plus high service temperature and smooth aerodynamic surface may lead to more extensive use of honeycomb construction in the aircraft industry.—**Reported by P. L. Rittenhouse for Oaks Ridge.**

New Films

Photo-Elastic Studies

A 16-mm. sound, black and white film entitled "Photo-Elastic Studies of Joined Section in Castings and Weldments" is now available from the Product & Market Development Committee, Steel Founders' Society of America, 606 Terminal Tower, Cleveland, Ohio. The film was derived from the Steel Founders' Society research project at Case Institute of Technology.

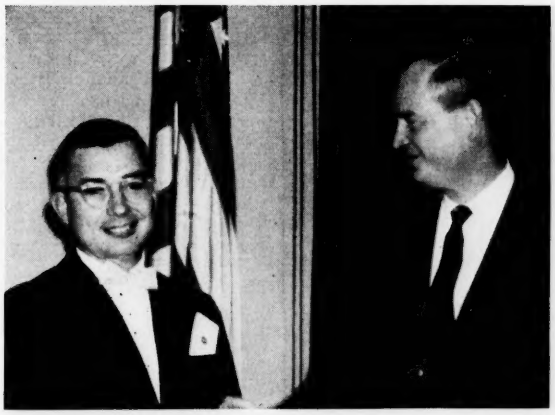
U. S. Steel Corp.

The 20th edition of the catalog of motion pictures prepared and distributed by U. S. Steel Corp. is available through R. W. Roth, Distribution Supervisor, Motion Pictures, U. S. Steel Corp., 525 William Penn Place, Pittsburgh 30, Pa.

Half-Second Butyrate

Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co., has prepared a 16-mm. full-color motion picture which describes a protective coating for exterior aluminum surfaces. The film discusses the laboratory and field tests made to determine the effectiveness of the coatings and describes in detail how the exterior aluminum surface of a large industrial plant built in 1953 was recently restored and protected against further deterioration with this weather-resistant lacquer. The film is available by writing to Eastman Chemical Products, Inc., 260 Madison Ave., New York 16, N. Y.

Describes Nuclear Sources



John H. Frye, Oak Ridge National Laboratories, Is Introduced at a Meeting of the Cincinnati Chapter by John Kahles, MetCut Research Associates. Dr. Frye spoke on "Commercial Atomic Power Sources"

Speaker: J. H. Frye

Oak Ridge National Laboratories

John H. Frye, director of the Metallurgy Division, Oak Ridge National Laboratories, presented a discussion on "Materials—the Bottleneck to Commercial Atomic Power" at a meeting in **Cincinnati.**

Dr. Frye pointed out that in the foreseeable future our natural supply of fuels will be depleted, at which time energy from fission of uranium and fusion will be contemplated. He compared coal versus uranium, discussing the various problems encountered in fully utilizing the energy obtained from fission of uranium. Taking one ton of coal as against one gram of uranium, it is a relatively simple task to blow hot gases given out by one ton of coal over pipes to heat water which can subsequently be converted to steam. The problem is a little different when using one gram of uranium as it would be impractical to blow air over this small mass since the full potential of energy would not be realized. In addition radioactive products would also be blown.

How then can we lick these problems to obtain an efficient output of energy from the fission of uranium? This is done by making a "biscuit" of uranium with stainless steel. The uranium is mixed with stainless steel to form the core of the "biscuit" and then the core is completely enclosed or clad with stainless steel. These "biscuits" are placed in a lattice arrangement, one above the other, with a small gap between them and water pumped over them to heat exchangers and converted to steam. This makes a rather efficient unit.

However, even with such a unit energy obtained from the fission of uranium is not on a competitive basis with energy received from coal in the United States, due to the high cost involved in the metallurgical fabrication and chemical processing of uranium. When these costs are reduced, nuclear fuel will replace coal for the production of electrical power.

For remote and inaccessible areas such as a radar station in the far north, reactors would be exceedingly important for the production of power. A reactor fuel core weighing in the neighborhood of one ton could supply power for two or three months before replenishing the uranium. If instead coal was used for power, it would take several thousand tons to produce the same amount of power.

Other examples where nuclear power is competitive with existing sources of power were discussed but again it was pointed out that it will be a few more years before energy from the fission of uranium will be competitive with natural fuels in the United States.—**Reported by Andrew S. Bartish for Cincinnati.**

Gives Talk on Beryllium

Bob Platz (Right), Vice-Chairman, Presents a Gift as a Token of Appreciation to William Santschi, Beryllium Corp., for His Talk on "Beryllium and Its Aircraft Structural Potential" at Long Island Chapter

Speaker: William H. Santschi

The Beryllium Corp.

William H. Santschi, associate director of research, The Beryllium Corp., presented a talk on "Beryllium and Its Aircraft Structural Potential" at a meeting of the **Long Island Chapter.** Mr. Santschi spoke on the past, present and future of this metal as a structural material.

The history of beryllium has not been one of large production. Prior to 1945 nearly all the metal was used in the production of beryllium copper. In that year the Atomic Energy Commission found a need for pure beryllium metal. The quantity desired required the construction of two new production plants.

After the construction of these plants, the two beryllium producers in the country renewed their efforts to make beryllium a structural material because, with its low specific gravity, high tensile strength, high modulus of elasticity, elevated temperature strength, creep resistance and resistance to stress rupture, etc., the manufacturers felt that there was a great future for beryllium. However, there are still difficulties to be overcome. Some of these difficulties are only temporary, such as availability and very high costs; others, which may be corrected by research, are poor ductility, methods of fabrication and purification.

Mr. Santschi then explained the methods of production. The ore, the largest part of which is imported, is hand picked to separate the gem-quality stone from the common ore. It is then concentrated and purified into beryllium beads. These beads are vacuum melted in a beryllium oxide lined furnace and then vacuum cast into a graphite mold ingot. After the ingot has cooled, it is turned down on a lathe to form chips which are subsequently made into powder. The powder is hot pressed into blocks from which slices are cut off and the metal extruded or rolled into simple shape. Forging is performed on a small scale after extruding, however. this also is restricted to simple design.

The use of beryllium metal in the aircraft industry today is small, but, when the need for a light, high-strength material overrules the cost factor, then beryllium metal has been and is used.

A great deal of research is being done on beryllium, including work on very high purity beryllium, alloying and many other improvement projects. Mr. Santschi feels that the complete picture looks good and believes that in the very near future beryllium metal can assist in the production of faster and better aircraft.—**Reported by A. P. Ingraham for Long Island.**

Outlines Toolsteel Developments

At a Meeting of Dayton Chapter, J. Y. Riedel, Toolsteel Engineer, Bethlehem Steel Corp., Spoke on "New Developments in Toolsteels". Shown, from left: W. T. Bryan, chairman; Mr. Riedel; C. Hewitt and L. McAfee

Speaker: J. Y. Riedel

Bethlehem Steel Corp.

J. Y. Riedel, toolsteel engineer, Bethlehem Steel Corp., spoke on "New Developments in Toolsteels" at **Dayton Chapter.**

Many people look for radically new tool materials to improve operations while, in fact, material is only one factor in tooling. No toolsteel, no matter how inherently good, can overcome deficiencies of the other factors in tooling, which include:

1. Mill practice equipment—This phase is the responsibility of the toolsteel producer to be sure that all his steel is uniform and within specifications.

2. Tool design—Very few tool designs are made from stress calculations, but are usually made from experience on similar tools. Cold extrusion experience in recent years has added much empirical data on design. An example of a tool design application is prestressing, which has improved performance on some tools as much as 500-1000%. Shot peening a surface, or using a shrink fit ring on a cylindrical tool, are examples of prestressing.

3. Heat treating — Improvements have occurred largely because of the use of improved furnace equipment and more accurate control of the operations rather than from any basic new developments.

4. Grinding—Since grinding leaves scratches which are a potential source of failure of the tool, it is important that it be done carefully. Considerable improvement in performance is sometimes gained by grinding so that the scratches are left in the direction of movement of a tool or a die. If possible, hardened tools should not be ground.

5. New steels, including wear, air hardening and free machining steels. Wear steels have high wear resistance, but because they are difficult to machine and grind it is not practical or economical to redress or sharpen tools made from this material. Air hardening steels have less residual stresses and warpage than quenched steels and are more uniform from part to part. High sulphur free machining steels were developed primarily to obtain improved machinability. On a large number of tools used for cutting and shaping of metal it makes no difference whether the tools contain high or low sulphur. The fact is that many tools are so overdesigned that they perform satisfactorily in service even when a more brittle material is used in making the tools. Production performance records show that unexplainable brittle types of tool failures occur more frequently with high sulphur tools than with low sulphur tools. It is Mr. Riedel's opinion that high sulphur toolsteels fall short of producing consistent and reliable service on modern high production applications.—**Reported by D. M. Ashfal for Boston.**

Presents Story of Uncommon Metals

Shown at a Meeting of the Rhode Island Chapter Are, From Left: Clifford S. Ey, Vice-Chairman; Bruce W. Gonser, Battelle Memorial Institute, Who Spoke on the "Uncommon Metals"; Miss Alice Golden, of the Appalachian Mountains Club, Who Talked on the "Mountains and Trails of New England"; and William P. Matthew, Chairman. (Reported by Gordon Partington)

Describes Telephone Dial System at Chattanooga

Speaker: Earl B. McClanahan

Southern Bell Telephone Co.

Members of **Chattanooga Chapter** heard a talk on the "Telephone Dial System" by Earl McClanahan, engineer, Southern Bell Telephone Co. His talk was preceded by a color movie on how telephone cable is made.

Mr. McClanahan discussed the present and future of the dial system which made the modern telephone system possible. He pointed out that without electronic equipment the system would be severely limited since enough women between the ages of 20 and 60 are not available to handle all the present calls. He demonstrated the present electromagnetic switch, which is about 18 in. long, four of which are required for a local call. To replace these four, telephone engineers are working to perfect an electronic switch about 1 in. long. Space is becoming more and more important to the telephone company, as is time used in dialing a call. Where the electromagnetic switch requires 0.001 sec., the electronic switch requires 0.00001 sec.

Mr. McClanahan described the dial system which "remembers" bits of information in the form of a code developed for use with dial phones. He explained how this code was developed and described the problems involved in making present dial numbers meet future need for more phone numbers than the combinations now available on the standard dial. This problem is further complicated by the system under development for dialing long-distance calls without the use of operators in which zone, central and individual numbers will have to be accommodated by the dial numbers.—**Reported by J. H. McMinn for Chattanooga Chapter.**

Missile Expert Is Guest at New York

Discussing the Government Missile Program Before the New York Chapter Were, From Left: J. P. Campbell, Technical Chairman; Frank Malone, Vice-Chairman; W. H. Steurer, Redstone Arsenal, Who Spoke on "Materials Problems of Rockets and Missiles"; and W. J. Kennelly, Jr., Chairman

Speaker: W. H. Steurer
Redstone Arsenal

Just three days after the Army shot this country's first artificial moon into outer space, the largest crowd in many years jammed the **New York Chapter** meeting to hear Wolfgang H. Steurer, Redstone Arsenal, discuss some of the "Materials Problems of Rockets and Missiles".

The principal materials problem in ballistic missiles lies in overcoming the aerodynamic heating that occurs, particularly upon re-entry into the earth's atmosphere from outer space. The problem becomes more acute as the intended range of the missile increases, since increased range means increased speed, and increased speed in turn means higher temperatures. Skin temperatures for intermediate range ballistic missiles may range between 5000 and 6000° F.

There are two basic ways to meet this problem: to increase the high-temperature strength-to-specific gravity ratio for the materials used; and to provide effective thermal insulation.

Since ballistic missiles are designed for extremely short life—on the order of seconds and minutes—it is possible to make use of new concepts of design. Long-time stability at high temperatures is not important; therefore it is permissible to use a material in a high-strength condition even though the condition is metastable.

For example, Dr. Steurer showed that at about 1000° F. the usable strength of a particular low alloy, high-strength steel, cold rolled quarter-hard, is 40% higher than the strength of the same alloy in its most stable condition, when considered over a 60-sec. lifetime. Similarly, the 15-sec. strength of aluminum alloy 2024 at around 570° F. is 2½ times its long-time strength.

Beyond a certain temperature level, it is necessary to separate the two functions of load-carrying and heat-carrying, dividing them among different materials. The major problem encountered in heat absorption and dissipation is that materials which have a large heat capacity, such as metals, are generally also good conductors. The necessity for both absorbing heat and reducing the temperature to which structural members are subjected has led Dr. Steurer to conclude that the solution lies in heterogeneous materials (i.e., a combination of two materials, one primarily for heat absorption and the other primarily an insulator to establish a thermal gradient). This kind of approach makes it possible to utilize thermal insulating materials more efficiently, even making use of their heat of vaporization for heat absorption.

When more durable space vehicles are designed many additional materials problems will have to be solved. Besides heat we will have to contend with such conditions as an almost perfect vacuum, meteorites and cosmic dust, and solar and cosmic radiation.

Dr. Steurer pointed out that the early work on rockets was done without thought of their use as weapons but simply out of a desire for exploration of the unknown. The greatest advances have come in the weapons field, however, since it was only when the war-making potentialities were realized that funds became available for research.

Dr. Steurer also expressed his belief that as man expands his explorations into outer space the world will see an end to the wars it has come to expect as inevitable. War would be supplanted by technological competition.

Dr. Steurer, a native of Freiburg, Germany, is in charge of materials research at the Army Ballistic Missile Agency located at Redstone Arsenal in Alabama. During World War II, he was chief of the material testing laboratory in the German Rocket Development Center at Peenemunde where the V-2 rocket was developed. He came to this country in 1945 along with many other German rocket experts, including Wernher Von Braun, his present chief.—**Reported by J. B. Campbell for New York.**

Rochester Presents First Scholarship

At a Meeting of the Rochester Chapter, Harold J. Bates, Fairfield Manufacturing Co., Spoke on "Gas Carburizing". During the meeting a $500 Chapter Scholarship was presented to Gilbert A. Asser of the University of Rochester. The scholarship is the first step in a series of such actions planned by the Chapter. Shown are, from left: Mr. Bates; Morton Finch, vice-chairman; Mr. Asser; Frank Trevett, chairman; Richard Eisenberg, professor of metallurgy at the University of Rochester

Defines Toolsteels at Jackson Meeting

C. W. Hendre, Metallurgist, Eaton Manufacturing Co., Technical Chairman of Jackson Chapter, Introduces George A. Roberts, the Guest Speaker of the Evening

C. R. St. John (Right), Jackson Chapter Chairman, Is Shown Presenting a 25-Year Membership Plaque to William J. Levy, One of the Chapter Organizers

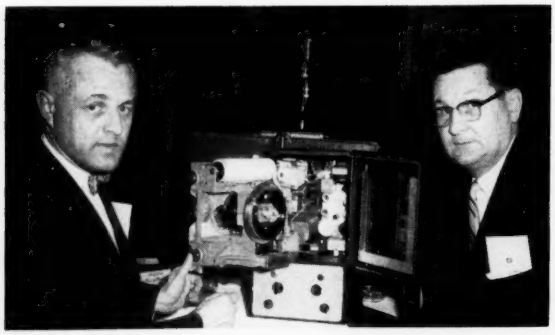
Speaker: G. A. Roberts
Vanadium-Alloys Steel Co.

Paul Scheid, chairman of student affairs, had 25 students representing the local high schools as guests of the **Jackson Chapter** during a recent meeting. Henry Dykema, head of high-school coordination at Michigan State University, presented a talk on "Metallurgical Engineering—Its Needs and Advantages".

George A. Roberts, vice-president, technology, Vanadium-Alloys Steel Co., and past president A.S.M., spoke on "New Developments in Toolsteels". Dr. Roberts' talk was directed to the students but was enjoyed by all the members. He defined toolsteels and explained the physical and chemical properties that are used to evaluate the different types. He explained the various carbides formed and the effect of heat treatment on these carbides. He also showed the wide variety of carbides that are used and the effect of changes of various amounts.

The talk also covered the ultra-high-strength steels and their applications. Aircraft and missile manufacturers are showing great interest in these materials because of the high strength-weight ratio at elevated temperatures.—**Reported by W. F. Stewart for Jackson Chapter.**

Featured in Dual Program at Chicago



Joseph E. Casey (Left), Leeds & Northrup Co., Presented a Talk on "Electronic Pyrometers" at Chicago. He is shown with H. Tykocki, the technical chairman

D. J. Girardi (Left), Timken Roller Bearing Co., Who Reported "Progress in Engineering Alloy Steels" at the Same Meeting, Is With Technical Chairman H. Dyer

Speakers: D. J. Girardi and J. E. Casey

During a recent meeting of the **Chicago Chapter,** two separate sessions were presented in a program for heat treaters.

"Progress in Engineering Alloy Steels" was the title of the talk presented by Daniel J. Girardi, manager, metallurgical research and process control, Timken Roller Bearing Co. Dr. Girardi pointed out significant developments and trends in low-alloy steels for moderately high temperatures in automotive applications and in anti-friction bearings, as well as in aircraft engines. He presented unpublished data on hardenability of 1% carbon steels and on transverse mechanical properties.

Joseph E. Casey, technical assistant to the sales manager, Leeds & Northrup Co., spoke on "Electronic Pyrometers and Their Applications". He demonstrated the proper installation and malfunctions of a modern pyrometer by means of experiments recorded in a color movie.

Eighteen awards were presented during the meeting, including an honorary life membership to Joseph L. Block, life memberships to Harry J. Kicherer and T. D. Hayes, and 25-year membership awards to: E. A. Anderson, A. M. Cornell, W. J. Dieckmann, A. G. Forrest, K. W. Graybill, Charles Hegel, J. A. Leahy, K. F. Schauwecker, C. S. Smith, A. Stolzenberg, H. M. Thornquist, Albert Tripp, T. O. Westhafer, Jack Wilson and L. J. Wise. — **Reported by H. W. Fredrick for Chicago Chapter.**

Young Speaks at Atlanta

Members of the **Atlanta Chapter** were recently privileged to hear National President G. M. Young talk on "The Extrusion Process". In addition, Mr. Young also gave a general survey of A.S.M. activities and showed sketches and slides of the new headquarters building.

Included on the program were several high-school students' exhibits of science projects.

Describes Tape-Controlled Machining

J. J. Jaeger, Pratt & Whitney Co., Inc., Spoke on "Impact of Numerically Controlled Machine Tools" at Hartford. At the speaker's table are, from left: W. E. Bancroft; Mr. Jaeger; and C. McDonall, chairman

Speaker: J. J. Jaeger

Pratt & Whitney Co., Inc.

J. J. Jaeger, chief engineer, Pratt & Whitney Co., Inc., spoke on the "Impact of Numerically Controlled Machine Tools" at a meeting of the **Hartford Chapter.**

Mr. Jaeger described the process whereby blueprint dimension data are translated to charts showing the desired movements of the various machine tool components. These data are then transferred to a tape which is inserted in the control mechanism of the machine tool itself. All the operator has to do is stand by while the machine is guided by the tape through its machining functions.

There are two types of numerical control—finite positioning, where the tool changes from one location to another to perform a function, and continuous control, where the path of the cut is controlled throughout its length. An example of the first type would be a hole drilled and the second type is exemplified by contour shaping.

Mr. Jaeger described the history of this type of control, its present uses, and its manufacturers, and he hinted at future prospects. The results of controlled machining include more accurate pieces with about double the output. Metallurgical uniformity of the material being cut was stressed because once this controlled tool starts cutting, it moves continuously with no feel for hard or soft spots.

Mr. Jaeger illustrated his talk with slides.—**Reported by D. W. Rockwell for Hartford Chapter.**

A. S. M. has produced and makes available for showing before chapters and educational institutions moving picture films pertaining to metals.

Describes Vacuum Melting Of Metals at Chattanooga

Speaker: James D. Nisbet

Allvac Metals Co.

James D. Nisbet, president, Allvac Metals Co., spoke on "Vacuum Melting of Metals" at **Chattanooga.**

Metallurgists today are constantly seeking better materials and trying to improve those which we already have. The search takes the path of pioneering and research, using small amounts of material, then making small tonnages in pilot plants, then production in quantity when proven. Or, as Mr. Nisbet outlined the path, research, development, production.

The metallurgist seeks to improve metals by strengthening their weakest point—grain boundaries. He does this by removing elements which weaken boundaries and adding elements which strengthen boundaries.

Three melting processes are available in the production of special metals—the vacuum melting process, the arc melting process, and a combination of the two. Factors to be considered in the production of metals as far as the introduction of impurities during melting include slag, atmosphere and crucible material. Arc melting, where the metal is one electrode, can prevent contamination of the crucible, while the use of vacuum can prevent contamination by atmosphere and slag.

Present steel methods are not good enough for the new special metals needed for high-temperature work. First, they are not hot enough and, second, they do not provide the protective atmosphere necessary to prevent contamination. Pilot plants using vacuum arc methods are now being made.—**Reported by J. H. McMinn for Chattanooga.**

ORVILLE R. PAYTON has been appointed to direct all sales promotion and advertising activity for Mueller Brass Co., Port Huron, Mich.

FREDERICK W. BURGIE is now general sales manager of the Doehler-Jarvis Division of National Lead Co.

The Los Angeles sales office, Allegheny Ludlum Steel Corp., has announced four new appointments: THOMAS M. HARRINGTON, formerly with the Chicago office, will continue in production sales of stainless, silicon and high-temperature alloys; F. KEITH LAMPSON, formerly with Marquardt Aircraft Co., is now a member of the technical service staff; ROBERT A. SPENCER and DANIEL DALE BARRON, sales training graduates, are toolsteel salesman and sales correspondent, respectively.

JAMES M. GAVIN has been elected vice-president and a director of Arthur D. Little, Inc. On Mar. 31, after 34 years in the army, Gen. Gavin retired at Fort Bragg. He was Army chief of research and development. He will assume his new duties at Acorn Park, the company's research center in West Cambridge, Mass.

RICHARD A. LOWE is now sales manager for the Baldwin-Lima-Hamilton SR-4 Products Group, to be responsible for the marketing of all SR-4 items used for measurement and control of weights and forces. He was formerly with Howell Instrument Co., Fort Worth, in the same capacity.

CHARLES M. BEEGHLY is now executive vice-president of Jones & Laughlin Steel Corp.; MARTIN K. SCHNURR succeeds him as president of the Strip Steel Division in addition to his present duties as president of the company's Stainless Steel Division.

FREDERICK J. CLOSE has been named general manager of the sales development and commercial research divisions of Aluminum Co. of America. He is well-known in the industry for his work on the aluminum-skinned Alcoa building.

OLIVER J. BROWN, JR., who has been in charge of strip plating and cleaning systems, has been appointed manager of continuous equipment sales for the Hanson-Van Winkle-Munning Co.

Minnesota Starts Them Young

Janet Ann Fries, Ten-Year Old Fifth Grader, Faithfully Attended the Minnesota Lecture Series on the "Corrosion of Metals". She is shown with C. E. Kimmel, Dow Chemical Co., and M. Nicholson, vice-chairman

The **Minnesota Chapter** has successfully completed a six-lecture course on the "Corrosion of Metals". One of the highlights of the program was the constant attendance of ten-year old Janet Ann Fries, a fifth grader at the Nathan Hale School in Minneapolis. Recently she visited a research laboratory in the Twin Cities and was shown one of the microscopes which magnified 500 diameters. Her comment: "That's very nice, but I have one at home that will magnify 1000 times". Janet is the daughter of Howard Fries of Fries Engineering Co. and the Vocational High School in Minneapolis.

About 65 members and friends attended the lecture series, which described the fundamentals of corrosion in the first two lectures, given by M. E. Nicholson of the University of Minnesota, and Emil Holmberg, International Nickel Co. The subsequent lectures concerned particular aspects of corrosion. Joseph Draley, Argonne National Laboratories, spoke about aqueous corrosion of aluminum at high temperatures and other problems of corrosion connected with the atomic energy program. James J. Heger, U. S. Steel Corp., discussed the nature, passivity and applications of stainless steel. C. E. Kimmel, Dow Chemical Co., covered corrosion resistance of magnesium and means of combating it when magnesium is the appropriate material to be used for a particular application. He mentioned the use of magnesium in anodes for cathodic protection. John Schley, Haynes Stellite Corp., discussed high-temperature corrosion and the phenomenon of liquid metal corrosion.

All the lectures were well illustrated with appropriate slides. The three-part movie, Corrosion in Action, prepared by International Nickel Co., and the movie, Zinc Controls Corrosion, by the American Zinc Institute, were used to summarize the principal points of the lecture series. —**Reported by M. E. Nicholson for Minnesota Chapter.**

Powder Metallurgy Is Toledo Meeting Topic

Speaker: J. K. Nyburg

Republic Steel Corp.

A talk on "Powder Metallurgy" was presented by James K. Nyburg, sales manager, Metal Powder Division, Republic Steel Corp., at **Toledo.**

Powder metallurgy is generally known as the art of producing metal products or metal powder parts by heat treating or sintering of compressed ferrous and nonferrous powders. Industry and engineers are interested in powder metallurgy because of low production costs. Parts have been diverted from either wrought steel, special sections or light castings with savings of 57, 68 and 35%, and so on down the line. These low production costs are realized through increased uniformity of product, ability to produce complicated shapes, elimination of all or part of the machining operations, drastic reduction of scrap, reduction of material handling, storage space and inventory, reduction of the use of skilled labor and reduction of part inspection, with improved finish appearance and wear characteristics which are greatly enhanced with no sacrifice in quality.

Forming of metal powder parts consists of five basic procedures. Any one of these procedures is predicated by the shape, ultimate usage, and desired ultimate strength of the finished part. They are:

1. Pressing and sintering.

2. A repetition of the first method plus a presintering operation as an intermediate step after pressing. This is generally utilized to facilitate machining after which the part is completely resintered.

3. Again a repetition of the first method with the additional operation of coining or sizing to develop higher physical properties by increasing the sintered density or to make the part conform to desired dimensional limits.

4. Repetition of the first procedure with the exception that compacting is conducted under heat.

5. Impregnation or infiltration, which can be done selectively or for the entire part, depending upon the desired density or strength build-up.

In a broad sense the physical property characteristics of powder metallurgy can be considered very similar to those of various ASTM grades of cast iron. This is accomplished by adding to the basic iron powder copper powder in varying percentages, graphite powders or a combination of the two. The speaker stated powder metallurgy is not a panacea for cheap production of all highly stressed parts. Every material has its place in industry, but as the technology of this process continues, it will see wider and wider applications.

The automobile still represents the largest market for powder metallurgy parts, and in the appliance industry more structural powder metallurgy parts are being used in dishwashers, home laundries, air conditioners and similar units.

Aircraft applications continue to increase. One reason for this is the development of sintered aluminum powder, a process which produces parts that maintain strength at much higher operating temperatures than conventional aluminum parts.

Mr. Nyburg showed two films, Powder Metal Magic, furnished by the Amplex Division of Chrysler Corp., and Precision Parts From Powdered Metal, courtesy of the Kwikset Powdered Metal Products Co.—**Reported by H. D. Randolph for Toledo Chapter.**

Metallurgical News and Developments

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Devoted to News in the Metals Field of Special Interest to Students and Others

New Tester—King Tester Corp. has available a Brinell tester designed to make hardness tests of the interior walls of cylinders or cylindrical openings within engine blocks, castings, etc. This portable tester uses a 5 or 10-mm. carbide ball with loads ranging from 500 to 1500 kg. and accurate Brinell readings are guaranteed for heretofore inaccessible spots.

Arc Furnace — Vacuum Specialties Co., Inc., Somerville, Mass., has available an arc furnace for vacuum or controlled atmosphere melting in a complete package unit designed for heavy production of consumable or nonconsumable ingots from 1½ to 6 in. in diameter by up to 30 in. long. Principal applications are in the nuclear and refractory metal fields.

Magnetic Conference — The fourth Conference on Magnetism and Magnetic Materials will be held in Philadelphia from Nov. 17-20, 1958, at the Sheraton Hotel. The Conference is sponsored by the American Institute of Electrical Engineers in cooperation with the American Physical Society, the Institute of Radio Engineers, the Metallurgical Society of A. I. M. E. and the Office of Naval Research. Authors should submit titles of proposed papers by Aug. 1, and abstracts by Sept. 1, to the program chairman, H. B. Callen, Dept. of Physics, University of Pennsylvania, Philadelphia.

International Symposium—An International Symposium on the "Physical Chemistry of Process Metallurgy" will be held Apr. 27-30 in Pittsburgh by the Metallurgical Society of the A. I. M. E. in cooperation with other divisions of A. I. M. E. Deadline for submission of papers is Jan. 1, 1959. Information for anyone planning to participate in the Symposium from: John F. Elliott, Room 8-109, M. I. T., Cambridge 39, Mass.

Capacitors—A complete line of solid tantalum capacitors that will withstand vibrational acceleration up to 40 g's at frequencies from 50 to 2000 cycles and temperatures up to 125° C. has been announced by Kemet Co., Division of Union Carbide Corp. They are made by compressing finely powdered tantalum metal into plugs that are then hermetically sealed in cylindrical metal cans. Absence of a liquid electrolyte eliminates leakage problems and greatly increases shelf life.

Induction Tube Mill—An economical and efficient process for producing continuous seam-welded ferrous and nonferrous tubing has been developed jointly by Induction Heating Corp. and American Roller Die Corp. The equipment combines the Ther-Monic generator and Ardcor tube-forming mill.

Rare Earth Data — New Process Metals, Inc., 45-65 Manufacturers Place, Newark 5, N. J., has announced the availability of information on the rare earth metals, including Rare Earth Metals in Ferrous Alloys, Rare Earth Metals in Nonferrous Alloys and Rare Earth Metals and Thorium in the Electronic Industry. Requests should be made on company letterhead.

Revised Bibliography—The Cobalt Information Center at Battelle Memorial Institute has revised its 125-page bibliography "Cobalt and Its Alloys". The booklet may be obtained by directing requests on company letterhead to the Cobalt Information Center, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Grant to Lehigh—A $64,050 grant has been made to Lehigh University by the Atomic Energy Commission to aid in establishing a new program in nuclear engineering, to be set up as an interdepartmental program by the departments of chemical and metallurgical engineering, chemistry and physics.

Merge Operations—Allied Research Products, Inc., Baltimore, Md., and Wagner Brothers, Inc., Detroit, have merged their operations as a part of an expansion program to provide more complete service and broader, more comprehensive product development for the metal finishing industry. The move was accomplished by Allied's acquiring the metal finishing operational assets and products of Wagner Brothers.

Ceramic Coating—Bettinger Corp., as a part of a project being carried out with the Convair Division of General Dynamics, has announced the development of a ceramic coating for magnesium-thorium, a recently created alloy which is lighter and stronger than aluminum or magnesium. It has applications on missiles and rockets where lightness is a distinct advantage, but it is a soft metal. With the application of the ceramic coating developed by Bettinger, the tensile strength of the alloy is improved and the abrasion, corrosion and erosion resistance of the alloy is increased.

Technical Meeting—New York University will hold a Technical Meeting on Titanium, the subject of which will be "Heat Treatment and Alloying of Titanium" on Sept. 8-9, 1958, at the University. Information from Harold Margolin, Assoc. Prof. of Metallurgical Engineering, New York University, College of Engineering, University Heights, New York 53, N. Y.

To Change Quarters—A. F. Holden Co., developers and manufacturers of the new luminous wall, instantaneous heating systems and all types of industrial heat treating equipment including salt baths, chemicals and heat treating supplies, opened new and larger quarters at 3490 E. Randolph St., Huntington Park, Calif. on June 1.

Welding Torch—An automatic welding torch with consumable wire and cold wire feed for high-purity atmosphere welding has been developed to supply filler material in critical zircalloy welds by the Vacuum Specialties Co., Inc., Somerville, Mass. It is suitable for other applications in the automatic welding of zirconium, zircalloy, titanium, molybdenum or other reactive metals and their alloys.

Opens New Office — Ampco Metal, Inc., has opened a new foundry and sales office at Garland, Texas.

Covers Vacuum Melting Methods at Cincinnati

From Left: Fred Robertshaw, Vice-Chairman, F. M. Richmond, Universal-Cyclops Steel Corp., Who Spoke on "New Vacuum Melting Techniques", and Russell Hoffman, Chairman, Shown at a Meeting in Cincinnati

During the Same Meeting, the Annual Student Awards were Distributed and the Chapter's Esslinger Award Was Presented to Monte C. Poole (Right), by William Licht (Left) of the University of Cincinnati

Speaker: F. M. Richmond
Universal-Cyclops Steel Corp.

Frank M. Richmond, manager, research and development department, Universal-Cyclops Steel Corp., described "New Vacuum Melting Techniques" at a meeting in **Cincinnati.**

Mr. Richmond discussed the need for such processes by pointing out the ever increasing demands in the aircraft and guided missile fields for better materials. In the superalloy field, the major problems facing the metallurgists are how to increase strength without further decreasing ductility, and scatter in mechanical properties.

Vacuum induction melting was turned to in an effort to solve these problems. The first heats of vacuum induction melting material (Inductovac®) actually exhibited greater scatter than air melt material. This scatter was found to be due to uncontrolled variations of trace elements, such as boron and zirconium, which had a potent effect on the high-temperature properties. Controlled additions of these elements resulted in significant increases in high-temperature strength, and increased titanium and aluminum contents resulted in still further increases. It appears that the vacuum melting process itself does not increase the strength of the steel but the chemistries possible by this technique do increase high-temperature strength. In addition to the boron, zirconium, titanium and aluminum modifications, the decreased manganese and silicon contents of vacuum melted material contribute to increased high-temperature strength.

Since the vacuum induction technique was restricted to rather small ingots (12 in. sq. and less), the consumable electrode vacuum melting technique was developed to provide larger size ingots. This operation is comparable to a large welding operation in that the material is cast in the form of electrodes and remelted under high-amperage low-voltage conditions in a vacuum. There are two modifications of this technique at use at Universal-Cyclops. These methods are the same except for the preparation of the electrode material. When using electrodes cast from an air melt heat, this process is known as Duomelt®; when the electrode is made from a vacuum induction heat, the process is known as Duovac®. Both remelting processes are carried out under a vacuum of one micron or less.

Since the Duovac process incorporates the advantages obtained by induction vacuum melting, material so made has high-temperature properties equivalent to Inductovac alloys. However, both the Duovac and Duomelt processes are capable of producing much larger ingots than the Inductovac process. High-quality superalloy ingots of 20 in. in diameter have been produced by these methods. The properties of these ingots have been shown to be greatly superior to equivalent sized ingots cast by conventional techniques.

Mr. Richmond illustrated his talk with numerous slides and closed with a color sound movie describing induction vacuum melting, consumable electrode melting and vacuum degassing. This latter process is not limited in size since the actual melting operation is carried out in air. Several large installations are now producing steel by this process. An experimental setup is in operation at Universal-Cyclops where 36 in. diameter ingots weighing 22,000 lb. have been produced. The primary advantage of this process is in its ability to reduce hydrogen content to extremely low values. This reduction in hydrogen has been shown to practically eliminate flaking in large turbine rotor forgings.—**Reported by H. L. Bockstiegel for Cincinnati.**

Letter From a Reader

"We note in the report of the paper by Mr. James Morris, of N.A.C.A., given before the Penn State Chapter, the heading of which is "Defines Metal-Bearing Fuels at Penn State" (April 1958, *Metals Review,* p. 23), there is a statement that reads as follows:

'Beryllium is very toxic, and both beryllium and lithium are relatively unavailable'.

"This same statement has appeared several times in the last three months. Apparently there is a general misconception as to the availability of lithium, both as regards ore, finished salts and the metal itself. There is a surplus of productive capacity. In support of the above statement, may I refer you to *Chemical & Engineering News,* May 5, p. 27, which states the following:

'Lithium: Supplies have increased 100-fold over the past 20 years and are now well beyond demand at present prices; new uses are needed'.

Also, in *Chemical Engineering Progress,* April 1958, p. 144:

'There are abundant supplies of lithium but too little inclination to exploit them. There are a host of promising uses for lithium but a decline of interest in either applying them or finding more. Why the contradiction?'

In view of the repetition of the statement that lithium is relatively unavailable, it is not surprising that it is not the subject of more evaluation research.

The article referred to which appeared in *Chemical Engineering Progress* points out that most of the lithium sold to the Atomic Energy Commission ends up in the stockpile, thus creating a reservoir of available lithium.

I sincerely hope that you may find it possible to print this letter in order that this misconception may be rectified."

Signed Walter M. Fenton,
Vice-President,
Product Research and Development
Lithium Corp. of America, Inc.

Fenn Professor Edits Home Study Courses

Professor Emil Perout, head of the metallurgical department of Fenn College, is now editing courses of the Metals Engineering Institute, according to an announcement by Anton DeSales Brasunas, director of this division of the A.S.M.

Prof. Perout is an assistant professor at Fenn and chairman of its department of metallurgy. He graduated from Fenn with a B.S. degree in metallurgical engineering, and received an M.S. degree in metallurgy from the University of Cincinnati.

Emil Perout

Before joining Fenn, he was associated with Clevite Research Center.

With 750 students now enrolled in the Institute, Dr. Brasunas said, "M.E.I. has had far greater enrollments in the first half of this year than in all of 1957. Many students are enrolling during the Summer months with a view of starting actual study this Fall. The interest in the courses, the splendid comments from students who are taking the courses, give every indication that this important new home study division is really catching on with industry".

Eighteen courses are now available for use by technicians, metallurgists, engineers, sales and management executives, and others who require specialized knowledge of metals. The courses, listed below, are available now. Further information may be readily obtained through use of the M.E.I. coupon on p. 74.

Elements of Metallurgy
Heat Treatment of Steel
High-Temperature Metals
Titanium
Steel Plant Processes
Metals for Nuclear Power
Stainless Steels
Electroplating and Metal Finishing
Primary and Secondary Recovery of Lead and Zinc
Steel Foundry Practice
Gray Iron Foundry Practice
Oxy-Acetylene Process
Blast Furnace Operations
Fundamentals of Ferrous Metallurgy
Toolsteels
Magnesium
Copper, Brass and Bronze
Arc Welding

Describes Nucleation and Casting

John H. Hollomon, Manager of Metallurgy and Ceramic Research, General Electric Co., and National Trustee A.S.M., Spoke on "Nucleation and Casting" at a Meeting in Milwaukee. Dr. Hollomon, center, is shown with Bob Maersch, technical chairman (left), and Marv Evans, chairman (right)

Speaker: J. H. Hollomon

General Electric Co.

John H. Hollomon, manager of metallurgy and ceramic research, General Electric Co., and National Trustee A.S.M., discussed "Nucleation and Casting" at a recent meeting of **Milwaukee Chapter.**

Dr. Hollomon described nucleation effects in crystallization of solids from liquids and demonstrated the effect of nucleation phenomena in the control of grain structure and composition in cast metals. Factors which limit the application of cast metal shapes included porosity, grain structure, macrostructure and composition.

The transition of a liquid which has no regular arrangement of atoms into a solid having regularity of atomic arrangement through growth from small regions of atomic regularity was illustrated with slides. The effect of minute particles of dirt to nucleate these regions of atomic regularity and catalyze the crystallization of metals was analogous to the difference in freezing characteristics of pure and impure water. Pure water freezes at $-39.5°$ C. Extremely pure copper is reported to freeze as much as 200° F. below the normal freezing point for this metal.

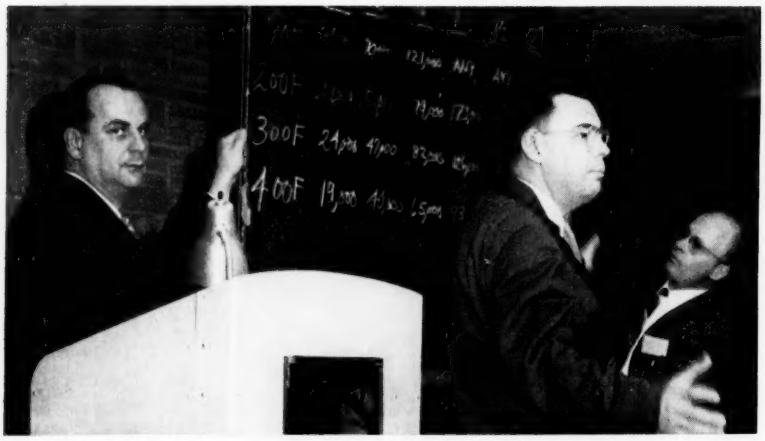
The dependence of cast metal grain size upon dirt in the metal was shown by the grain size difference in castings from the liquid metal after centrifuging to segregate the impurities in the melt. The dirty metal developed a small grain size. The higher purity metal developed a large grain size. This effect was also illustrated by photomicrographs of cast aluminum ingots. The metallographic structure consisted of a fine-grained chill layer caused by moldfacing dirt, a large columnar-grained rimming area of higher purity metal, and fine-grained core area which developed small equiaxed grains due to segregation of dirt to the center of the casting during freezing.

The effectiveness of a nucleating agent to catalyze the solidification of a liquid and to control the grain size in cast metal was shown to be dependent upon the crystal and chemical match of the nucleating agent with the matrix material. Ultrasonic vibration during solidification of a liquid was also mentioned as a method of controlling grain size in metals.—**Reported by J. D. Sullivan for Milwaukee Chapter.**

One of the features at the new A.S.M. Headquarters Building will be an attractive mineral garden in the center of the Plaza area. With concrete poured for the first time last month, the building site is a beehive of activity as construction goes forward rapidly.

In view of this progress, ores to be displayed in the mineral garden are being scheduled for delivery to the site this Fall. Many ores, ranging in size from one to four feet high, are already promised from many parts of the United States and Canada and it is hoped that ores will also come in from other parts of the world. If you are interested in having unusual ores displayed in this beautiful mineral garden, complete details of delivery, etc., are available from A.S.M. (7301 Euclid Ave., Cleveland 3, Ohio).

Demonstrates Ferrous Welding Processes



N. C. McClure (Left), Chairman, and J. W. Fredrickson (Right), Program Chairman, Lend a Hand to the Speaker, W. D. Doty, Applied Research Laboratory, U. S. Steel Corp., as He Presented a Talk on "Metallurgy of Ferrous Welding" at a Recent Meeting Held by the Saginaw Valley Chapter

Speaker: W. D. Doty
U. S. Steel Corp.

Members of the **Saginaw Valley Chapter** heard W. D. Doty, division chief of bar, plate and forged products, Applied Research Laboratory, U. S. Steel Corp., speak on "Metallurgy of Ferrous Welding" during a recent meeting.

Dr. Doty reviewed the shielded arc and submerged arc welding processes and important factors in the weldability of steel. He also discussed methods for evaluating weldability and the development of a new high yield strength alloy for welded structures.

In welding of thin materials (½ in. or less), the temperature gradient preceding the molten pool is very steep, while the gradient following the molten pool is slower. The temperature gradients on thick sections (1 in. or greater) are steep, both preceding and following the molten pool. The maximum change in plate thickness effect on weld joining of materials occurs between ½ and 1 in.

The most severe welding operation, from a metallurgical viewpoint, is tack welding because of the general use of a small electrode with low heat development. Since it is the most severe welding operation, a test for determining weldability or crack susceptibility of different steels using the tack weld principle has been developed.

This test is performed with an under bead crack specimen which is prepared by placing a weld bead longitudinally on a 3 in. x 2 in. steel sample. The specimen is sectioned lengthwise through the weld bead and then submitted to a magnetic particle inspection test to show up the under bead cracks. The weldability or crack susceptibility of the material is determined by measuring the crack length and is expressed in percentages of the total length of the weld bead.

The two most important physical properties of welded joints are ductility and notch toughness. The ductility of the heat affected zone can be improved by preheating. Notch toughness is the most important property of a welded joint and requires the proper selection of welding conditions to obtain the desired microstructure on cooling after weld.

Low carbon martensite and low carbon lower bainite have good notch toughness properties, ferrite and upper bainite have poor properties, and high carbon martensite has very poor notch toughness properties.

U. S. Steel has developed a high yield strength alloy steel known as "T-1" for welded structures. The carbon content was held low to obtain good weldability and good low-temperature notch toughness. Boron was used to conserve sometimes critical alloys, such as nickel, and copper was added to give corrosion resistance.

"T-1" was designed to be welded with low-hydrogen electrodes without preheat to obtain the desired microstructure by low carbon martensite. All medium carbon alloy steel must be preheated before welding to prevent the formation of martensite on cooling with the resultant poor physical properties.

The yield strength of "T-1" steel is 90,000 psi. minimum, with a tensile strength of 105,000 psi. and elongation of 18%. The steel is supplied in a quenched and tempered condition.

The meeting was concluded with an interesting question and answer session.—**Reported by H. E. Gillihan for Saginaw Valley.**

Compliments

To ICHIJI OBINATA on his election to director of the Research Institute for Iron, Steel and Other Metals, Tohoku University, Japan.

♦ ♦ ♦

To DONALD J. MCPHERSON who received a Distinguished Alumnus Award from Ohio State University for his "outstanding achievements in research and development of high-temperature alloys, for his creative advancements in the methods of metals research, for his demonstrated leadership in the field of institutional research, and for his contributions to the advancements in technology of our nation". Dr. McPherson is manager of metals research at Armour Research Foundation.

♦ ♦ ♦

To J. H. HOLLOMON, national trustee A.S.M., and manager of the metallurgy and ceramics research department, General Electric Research Laboratory, on being awarded the Rosenhain Medal for 1958 by the Institute of Metals in London. The medal is awarded in recognition of outstanding contributions to metallurgy by persons under the age of 45 and commemorates Walter Rosenhain, an internationally known physicist and engineer who made noteworthy contributions to the science of metallurgy before his death in 1934.

♦ ♦ ♦

To the following A.S.M. members who have been honored by the American Foundrymen's Society: HARRY W. DIETERT, chairman of the board, Harry W. Dietert Co., has been elected president A.F.S.; HOWARD J. ROWE, chief metallurgist, castings division, Aluminum Co. of America, has been awarded the McFadden Gold Medal for "outstanding contributions to the light metals branch of the castings industry"; FRANK S. BREWSTER, director of research and development, Brumley-Donaldson Co., has been given a Service Citation for "valuable service in the development and dissemination of basic sand technology"; FRED G. SEFING, metallurgist, development and research division, International Nickel Co., has received a Service Citation for "fostering foundry educational programs at all levels"; and FRANKLIN B. ROTE, technical director, Albion Malleable Iron Co., "for noteworthy contributions in furthering the technical prestige of the Society".

A.S.M. spends $44.50 to service each member of the Society for a period of one year.

Reports on Concepts of Creep in Design

Hans Conrad (Center), Westinghouse Research Laboratories, Presented a Talk on "New Concepts in Creep" at a York Meeting. Shown, at left and right, are A. McNeillie and C. A. Sloat, co-managers of the meeting

B. S. Norris (Left), York Corp., Presently on Special Assignment for the Atomic Energy Commission, Was Presented a 25-Year Membership Plaque at This Same Meeting by E. T. Vitcha, Chairman of the Chapter

Speaker: Hans Conrad

Westinghouse Research Laboratories

Hans Conrad, research metallurgist, Westinghouse Research Laboratories, spoke on "New Concepts in Creep Applied to High-Temperature Alloy Design" at a recent meeting of the **York Chapter.**

In the past ten years we have made considerable progress in our knowledge and understanding of the deformation of metals. A significant breakthrough has been the recognition that recovery mechanisms based on diffusion are rate controlling at temperatures greater than 0.5 T_m, where T_m is the melting temperature in °K. Consequently, *high-temperature* deformation is defined as deformation at temperatures greater than 0.5 T_m.

That 0.5 T_m actually represents a fairly sharp dividing line between low-temperature and high-temperature deformation is supported by the following experimental evidence:

1. The yield strength and tensile strength of most alloys decrease very sharply at temperatures $>$ 0.5 T_m.
2. The softening or recrystallization of metals and alloys occurs at approximately 0.5 T_m.
3. Dispersion of precipitated phases become ineffective at temperatures $>$ 0.5 T_m.
4. At temperatures $>$ 0.5 T_m the activation energy remains constant at a value equal to that for self diffusion.

At temperatures below 0.5 T_m various obstacles can impede the movement of dislocations in a metal lattice and thus impart strength. These obstacles are an atmosphere of solute atoms about the dislocation, the stress fields of other dislocations, grain boundaries, short range and long range order, clusters of solute atoms and precipitated particles. At high temperatures these obstacles either become ineffective because of increased atomic mobility, or they are overcome by the climbing of dislocations over them. A metal thus loses its strength at high temperatures.

To obtain a creep resistant alloy at high temperatures, we must use a material with a low diffusion coefficient, use a crystal structure in which dislocation climbing is retarded, and disperse particles of 20-100 atomic diameter size and spacing throughout the lattice. These particles must be of a hard material and have a very low solubility in the matrix.

The value of the diffusion coefficient can be decreased by using metals of high melting temperature and employing a close-packed crystal structure such as F.C.C. rather than an open structure such as B.C.C. Dislocation climbing is retarded in a close-packed crystal structure which readily forms annealing twins and also in ordered structures. The oxides of scavengers such as aluminum, magnesium, zirconium and titanium have a very low solubility in most metals and thus are especially suitable for stable dispersions.

These various concepts apply to the presently used high-temperature superalloys and they are being employed to develop new alloys for use at temperatures above 1500° F.

At this meeting sustaining members and past chairmen of the York Chapter were honored. B. S. Norris was presented a 25-year membership award.—**Reported by A. McNeillie for York Chapter.**

Speaks on Materials for Missiles

A. Hurlich, Chief of Engineering Materials Section, Convair Astronautics, Spoke on the "Selection of Materials for Long-Range Missiles" at a Meeting Held by San Diego Chapter. Shown are, from left: T. Bradley, executive committee; W. H. Eisenman, national secretary A.S.M.; George D. Cremer, chairman; Mr. Hurlich; and F. Filippa, secretary of San Diego Chapter

Define Electrode and Zone Melting

Present at a Meeting of the Montreal Chapter Were, From Left: G. M. Young, National President A.S.M.; A. James Kiesler and William H. Smith, General Electric Co., Who Spoke on "Consumable Electrode Melting" and "Zone Melting"; and E. M. Seale, a Past Chairman of the Montreal Chapter

Speakers: A. J. Kiesler and W. H. Smith
General Electric Co.

At a meeting of **Montreal Chapter,** A. James Kiesler, head, melting and solidification laboratory, General Electric Co., spoke on "Consumable Electrode Melting", and W. H. Smith, research laboratory, General Electric Co., spoke on "Zone Melting". They outlined some of the experimental work being carried out in melting, casting and refining of high-temperature metals and alloys.

In devising melting techniques for such refractory metals as tungsten, molybdenum, titanium, tantalum and zirconium, it is necessary not only to eliminate contact of the molten metal with air, but also to avoid the use of conventional crucible materials, all of which are attacked by the molten metals. Such ceramic materials as silica, alumina, magnesia and thoria are all attacked to a greater or lesser extent. Many other crucible materials, including graphite, have been tested, but the contamination, although small, is definitely undesirable. In addition, the use of nonconsumable electrodes, such as tungsten or graphite, resulted in contamination of the melt by the electrode material. The most satisfactory solution to this problem appeared to be the use of the consumable electrode technique.

The consumable electrode vacuum and inert atmosphere arc melting furnace embodies some of the most advanced designs in the metallurgical industry. It includes such safety devices as a closed circuit television system to allow the operator to view and control the furnace from the control console and possesses the versatility necessary to melt all types of refractory metals and alloys. The process consists of feeding briquettes or pellets into the vacuum-tight casing, stacking and sintering them and then melting the consumable electrode so formed into a water-cooled copper crucible.

In the development of advanced types of high-temperature alloys, a technique which can produce metals in which impurities are reduced to parts per million was described by Mr. Smith. In this work metal is purified to a remarkable degree by the zone melting technique, which permits further study of a metal by eliminating the variables introduced by impurities which may be present. The principle of zone melting is similar to vacuum distillation, but the separation is made between the liquid and the solid phase. The separation of impurities is effected by slowly moving a narrow melted zone through a bar of solid material by slowly moving the heat source. The impurities concentrated in the molten zone solidify in the last portion of the bar and when this portion is cut off a bar of high-purity metal remains. Repeating the process results in bars of greater and greater purity.

In the extension of this work to high melting point metals, the process must be carried out without a crucible so as to eliminate the problem of crucible contamination. To accomplish this the rod of metal is held vertically in an inert atmosphere. A concentrated power source is applied to the rod causing a small portion of the rod to melt. Surface tension of the molten metal holds it in place between the two solid portions of the rod. Purification is accomplished in the same manner as in conventional zone melting and the impurities are concentrated in the liquid metal as the zone passes slowly through the rod.—**Reported by D. F. McLeod for Montreal.**

Cites Factors Governing Corrosion Resistance

Speaker: C. J. Walton
Aluminum Co. of America

C. J. Walton, chief, chemical metallurgy division, Alcoa Research Laboratories, presented a talk on the "Effects of Metallurgical Factors on Resistance to Corrosion of Aluminum Alloys" at **Penn State Chapter.**

Metallurgists are called upon to develop alloys which must possess not only certain physical properties but also high resistance to corrosion and stress corrosion cracking. To produce these alloys, the metallurgist must add elements to the base metal. Additions made to influence physical properties may also affect resistance to corrosion.

Alloys generally show their maximum resistance to corrosion when they are composed of a single, homogeneous phase. In the decomposition of supersaturated solid solutions, the precipitation of a second phase is apt to affect the resistance to corrosion and stress corrosion cracking of the alloy. Establishment of a correlation between the type and extent of precipitation and resistance to corrosion provides a basis for the metallurgist to develop artificial aging treatments that enhance resistance to corrosion.

The electrochemical properties of alloys are important in the study of corrosion processes because most corrosion in aqueous solutions is electrochemical in nature. Different phases in an alloy system may have different electrode potentials, and under corrosive conditions tend to create galvanic corrosion cells. The magnitude of the galvanic cells will vary with the relative size and continuity of the anodic and cathodic phases, and with the nature of the electrolyte.

Thus the measurement of electrode potentials and polarization characteristics of various metallurgical phases in different electrolytes gives an insight into the mechanism of corrosion processes, especially that relating to intergranular corrosion. Solution potential measurements can also be used to follow or correlate certain metallurgical changes, as diffusion and rate of decomposition of solid solutions.

To illustrate the effects of these metallurgical factors on resistance to corrosion, Mr. Walton discussed the aluminum-copper and aluminum-magnesium systems. In these systems, the resistance to corrosion is related to a second phase which precipitates from solid solution.—**Reported by R. Heacox for Penn State.**

A.S.M. is the largest publisher of books for the metals industry in the world.

Reviews Magnetic Properties

Warren Eberly (Left), Carpenter Steel Co., Spoke on "Low Expansion, Glass-to-Metal Sealing and Soft Magnetic Alloys" at a Meeting of Boston Chapter. He is shown with Richard A. Pomfret, the program chairman

Speaker: Warren Eberly

Carpenter Steel Co.

"Properties of Low Expansion Alloys, Glass-to-Metal Sealing Alloys and Soft Magnetic Alloys and Their Applications" were described by Warren Eberly, metallurgist, Carpenter Steel Co., at **Boston.**

Many alloys in the iron-nickel series containing 30-80% nickel are being used in the electrical and electronic industries because of a specific property requirement. A review of the commercially available alloys, along with an explanation of their properties, was given, as follows:

Nickel Content	Property
30-32%	Decreasing permeability with increasing temperature from −60 to 250° F.
36%	Extreme low coefficient of expansion from −60 to 300° F.
39%	Expansion characteristics match pyrex glass up to 350° F.
42%	Expansion characteristics, glass-to-metal sealing and manufacture of Dumet wire.
46%	Expansion characteristics which match ceramics and enamels.
49%	Expansion characteristics and soft magnetic properties.
52%	Expansion characteristics and glass-to-metal sealing.

Alloys of the iron-nickel series having additional elements also show expansion and magnetic properties required in the electronic and electrical fields. These are:

Nickel Content	Other Elements	Properties
28%	17% Co	Glass-to-metal sealing with pyrex
42%	5% Cr	Glass-to-metal sealing with G-12 glass
45%	5% Cr	Glass-to-metal sealing with G-12 glass
43%	3% Si	Magnetic properties
47%	3% Mo	Magnetic properties
77%	3.5% Cr 5% Cu	Soft magnetic alloys, high initial permeability
79%	4% Mo	Soft magnetic alloys, very high initial permeability
79%	5% Mo	Soft magnetic alloys, very high initial permeability

Processing and heat treatment have a marked effect on these properties and must be closely controlled. The recommended handling technique was reviewed for each alloy.

A chart illustrating the effect of increasing nickel content on expansion and magnetic characteristics for specific requirements was shown.—**Reported by J. B. Savits for Boston.**

Demonstrates Hortonclad Uses

R. A. Davis (Left), Chicago Bridge & Iron Co., Is Shown Discussing Hortonclad Test Specimens With Members of the Birmingham Chapter, Including Bruce M. Jones, Jr., Chairman (Right). (Photo M. G. Smith)

Speaker: R. A. Davis

Chicago Bridge & Iron Co.

R. A. Davis, resident staff engineer, Chicago Bridge & Iron Co., discussed the "Applications of Hortonclad" at **Birmingham.**

Hortonclad is a composite metal consisting of an alloy or special metal which is integrally and continuously bonded to the backing plate by a high-vacuum bonding process. Other processes of producing clad plates are the hot rolling method and welding of overlapping beads of weld metal. Clad plates make practical the fabrication of process equipment, tanks and other clad structures, which provide the same benefits as solid corrosion resistant material at much less cost.

Two backing plates and two plates of clad material are assembled with the brazing alloy to form a sandwich. A separating material is placed between the clad sheets to prevent their bonding together during the cladding operation. The edges of the sandwich are sealed by manual or automatic welding to form an air-tight chamber for evacuation and it is placed in a furnace for high-vacuum bonding. A continuous high vacuum is maintained on the sandwich throughout the bonding cycle, thus assuring that all air is excluded from the bonding area. Gases released from the plates at elevated temperatures are also removed, thus eliminating the need for a flux. The vacuum also functions to draw the base plates together; atmospheric pressures in excess of 2000 lb. per sq. ft. force the cladding and backing material into close contact. After bonding, the weld seal is removed to separate the clad plates.

The advantages of producing a clad plate in this manner are as follows: The desired thickness of the cladding and backing material remain unchanged during bonding (thickness tolerances are governed only by the tolerances of the rolling mills producing the individual components); high vacuum effectively excludes harmful atmospheric gases during the entire time the metal is at elevated temperatures; a clean, strong, uniform bond is produced over the entire surface of large clad plates; and a high-quality finish on clad surfaces is maintained.

Composite plates with predesigned internal channels of various shapes have been produced by the high-vacuum bonding process. Hortonclad channeled plates may be used for heat exchanger plates, press platens and internally cooled wind tunnel plates. Where unusual corrosion conditions exist, a double-clad plate can be made with one type metal on one surface and another type on the other surface for use in partitioned vessels.—**Reported by Robert Fisher for Birmingham.**

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research,
Western Reserve University, Cleveland,
With the Cooperation of the John Crerar Library, Chicago.

General Metallurgy

284-A.* Wrought Titanium. J. R. Crane. *Birmingham Metallurgical Society, Journal,* v. 38, Mar. 1958, p. 27-54.

Experiences in England with graphite electrode furnace and consumable electrode vacuum furnaces for melting Ti and Ti alloys; forging practice, problems in production of slabs, rods and bars; techniques in machining, rod rolling and grinding. Operations and equipment of hot and cold rolling for production of strip and sheet; descaling procedures, experiences in production of wires and tubes; welding processes. (A-general; Ti)

285-A. Wrought Titanium. New Corrosion Resistant Metal Developed by I.C.I. *British Petroleum Equipment News,* v. 6, no. 3, 1957/1958, p. 53-56.

(A-general; Ti-b)

286-A.* Lithium. D. R. Williamson. *Colorado School of Mines, Mineral Industries Bulletin,* v. 1, Mar. 1958, 8 p.

Mineral sources and world reserves; characteristics of Li metal and Li compounds; processes for concentration and production. Present and prospective uses of Li and Li compounds. Data on production and consumption, companies producing and refining Li products. 60 ref. (A4, B-general; Li)

287-A. Progress Report on Titanium. N. P. Inglis and M. K. McQuillan. *Endeavour,* v. 17, Apr. 1958, p. 77-84.

6 ref. (A-general; Ti)

288-A. Productivity in the Iron and Steel Industry—1945-1956. M. D. J. Brisby. *Engineer,* v. 205, Mar. 1958, p. 425-426.

7 ref. (A4p; ST)

289-A.* History of the Early British Work on Plutonium Metallurgy. J. G. Ball and W. B. H. Lord. *Institute of Metals, Journal,* v. 86, Apr. 1958, p. 369-379.

Use of dilatometry and thermal analysis to investigate the allotropy and alloying behavior of Pu, with other work on casting, forging, and extrusion, electrical resistivity, magnetic susceptibility and determination of crystal structures. 10 ref. (A2, A-general; Pu)

290-A. The Development of Handling Techniques for the Study of Plutonium Metal. W. B. H. Lord and M. B. Waldron. *Institute of Metals, Journal,* v. 86, Apr. 1958, p. 385-392.

12 ref. (A7r; Pu)

291-A.* The Manufacture and Application of Tungsten Carbide in Australia. W. J. Kelsey. *Institution of Production Engineers Journal,* v. 37, Feb. 1958, p. 92-104.

Development, manufacture, standardization, tool fabrication and application of cemented tungsten carbide.
(A-general, H-general; W, 6-69)

292-A. High Speed Steels—Types and Treatments. *Mechanical World and Engineering Record,* v. 138, Feb. 1958, p. 76-78.

(A-general, Q-general; TS-m)

293-A. How to Treat Pickle Liquors in a Small Plant. Edward W. Lang. *Metal Progress,* v. 73, May 1958, p. 93-96.

A crystallization-regeneration unit at Vulcan Rivet & Bolt Corp., Birmingham, Ala., has solved the problem of disposal of pickle liquors from a 1200-gal. batch tank. The system is based on removing 400-gal. portions of liquor, crystallizing ferrous sulphate for economical disposal and returning regenerated liquor to the tank. (A8b, L12g)

294-A. Better Ways to Fabricate High-Temperature Materials. *Metal Progress,* v. 73, May 1958, p. 97-101.

Aircraft and missile needs are setting the pace for development of improved high-temperature materials and better methods for fabricating them. Investment casting in vacuum opens up a promising area. Slip casting can be used to fabricate parts that cannot be made any other way. Better control of processing variables in wrought fabrication gives improved properties.
(A-general, Q-general, 2-62; SGA-h)

295-A.* Pearlitic Malleable Iron. James H. Lansing. *Metal Progress,* v. 73, May 1958, p. 102-103.

Rapid increase in use of pearlitic malleable castings in recent years presages many new areas of application for the future.
(A-general, 17-57; CI-s)

296-A. Metallurgy in Industry—A Look Ahead. H. S. Turner. *Metal Progress,* v. 73, May 1958, p. 109-110, 174.

To devise the necessary new and cheaper operations, the process metallurgist must work with models and pilot plants (not miniatures of present equipment) and be guided by a thorough knowledge of reaction kinetics. Experimentation with existing full-scale equipment is certain to give results of only limited application and at high cost.
(A9p, 17-56)

297-A. Iron Ore—Review and Outlook. Russell C. Fish. *Mining Congress Journal,* v. 44, Feb. 1958, p. 67-69.

(A4p; Fe, RM-n)

298-A. Treatment of Tin Slags. C. W. Jensen. *Mining Magazine,* v. 98, Feb. 1958, p. 79-81.

Recovery of Sn and W from old slag dumps. (A8d, Sn, W, RM-q)

299-A. Role of Metallurgy in Atomic Energy Technology. Pt. 1. A. Blainey. *South African Institute of Mining and Metallurgy, Journal,* v. 58, Dec. 1957, p. 226-255.

General review. 9 ref.
(A-general, W11p)

300-A. Titanium Production Developments Including Metallurgy and Alloying. R. I. Jaffe. Battelle Memorial Institute. (Office of Assistant Secretary of Defense for Research and Development.) *U. S. Office of Technical Services,* PB 121632, Aug. 1957, 102 p. $2.75.

A review. (A-general; Ti)

301-A. A Survey of the Literature on Rhenium. C. T. Sims, E. N. Wyler, G. B. Gains and D. M. Rosenbaum. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121826, June 1956, 236 p. $4.50.

(A-general, 10-54; Re)

302-A. Alumina-Base Cermets. Pt. 4. J. W. Lindenthall, J. G. Stradley and T. S. Shevlin. Ohio State University Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131342, May 1957, 19 p. $.50.

Studies were made by pre-reacting alumina with easily reducible oxides such as those of Cr, Ni and Co. Compounded into cermet compositions, these mixed oxides promoted wetting or reaction with the metallic constituents. Specimens containing 50 vol. % of iron and 50 vol. % of oxide were developed. They were nearly nonporous, as strong as the metal alone, and their high elastic moduli indicated good bonding.
(A-general; Al, Cr, Co, Fe, Ni, 6-70)

303-A. Foamed Metal Developed for Sandwich Construction Core. Pt. 1, 2, 3. J. Bjorksten, J. C. Elliott and R. J. Roth. Bjorksten Research Laboratories, Inc. (Wright Air Development Center.) *U. S. Office of*

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published in full within the next few months.

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

Technical Services, PB 131419, 131466, 131467, June 1952, Sept. 1953, May 1954, 3 v., 76 p. $2.25.

Foams prepared from Mg-Al alloys. (A-general, 7-59; Al, Mg)

304-A. Nickel and Its Alloys. J. G. Thompson. National Bureau of Standards Circular 592. Feb. 5, 1958. 87 p. $.60. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

History, occurrence, recovery, refining, microstructure, chemical properties, physical properties, mechanical properties and effect of minor constituents on properties of Ni; industrial melting, casting, fabrication and uses; composition, properties, and applications of important ferrous and nonferrous Ni alloys. 801 ref. (A-general; Ni)

305-A. Some Results of High-Vacuum Metallurgy. W. Scheibe. *Zeitschrift für Metallkunde*, v. 48, no. 3, 1957, p. 91-100. (Henry Brutcher, Altadena, Calif., Translation no. 4111.)

Degassing of plain carbon and alloy steels. Distillation methods (nonferrous, including noble metals), vacuum sintering, vacuum annealing; economics of vacuum metallurgy. (A-general, D9s, C22, B16, J23, 17-53, 1-73)

306-A. Study of Alloys of Magnesium With Various Rare-Earth Metals. N. M. Tikhova and L. A. Afanas'eva. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 38-41. (Henry Brutcher, Altadena, Calif., Translation no. 4166.)

(A-general; Mg, *EG-g*)

307-A. Present Economic and Technical Position in the Field of Titanium. Richard Kieffer and Friedrich Benesovsky. *Berg-und Huettenmaennische Monatshefte*, v. 101, 1956, p. 292-300. (Iron and Steel Institute Translation no. 560.)

Previously abstracted from original. See item 211-A, 1957. (A4s, C-general; Ti, RM-n)

308-A. Organization of the Supply of Materials and of Production as a Means for Planning and Management. Werner Schutte, Ulrich Sabass, Hans-Heinrich von Lintig and Anton Schutz. *Stahl und Eisen*, v. 77, Aug. 8, 1957, p. 1045-1064. (Iron and Steel Institute Translation no. 799.)

Previously abstracted from original. See item 403-A, 1957. (A5b; ST)

309-A. (French.) **Progress Report—1955-1956.** *Institut de Recherches de la Siderurgie*, Series B, no. 36, Dec. 1957, 242 p.

Research in the steel industry. (A9h; ST)

310-A. (French.) **Production Costs of Openhearth and Electric Arc Furnaces.** J. C. Robin. *Metallurgie et Construction Mecanique*, v. 90, Apr. 1958, p. 291-293.

(A4s, D2, D5; ST)

311-A. (French.) **Presence of Germanium in Rumanian Ores.** Jeana Buzincu and Maria Nicolaid. *Revue de Métallurgie (Bucarest)*, v. 2, 1957, p. 111-112.

(A11a; Ge, RM-n)

312-A. (German.) **Planning the Handling of Bulk Materials in the Ironworks.** Volker von Branconi and Friedrich Wilhelm Griese. *Stahl und Eisen*, v. 78, Apr. 17, 1958, p. 465-475.

(A5a, W12; Fe, RM-n)

313-A. (German.) **Reloading Plants and Storage Yards for Ore on Its Way to the Works Harbor.** Kurt Rosenbaum. *Stahl und Eisen*, v. 78, Apr. 17, 1958, p. 475-483.

(A5, W12; Fe, RM-n)

314-A. (German.) **Future Metal Resources.** Ferdinand Friedensburg. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, Dec. 1957, p. 573-626.

Estimates of the total amounts of ores; effects of higher prices and improved extraction techniques. (A11a, A4; RM-n)

315-A. (German.) **Present and Future U. S. Mineral Resources.** Elmer W. Pehrson. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, Dec. 12, 1957, p. 577-584.

(A4, A11a; RM-n)

316-A. (Portuguese.) **The Steel Industry in the Rio Doce Valley.** Amaro Lanari, Jr. *Engenharia, Mineracao e Metalurgia*, v. 26, Oct. 1957, p. 211-213.

New plant planned with Brazilian-Japanese financing (including Brazilian government participation). Details of planned production program, equipment, flowsheet. (A-general; ST)

317-A. (Portuguese.) **A Suggested Policy on Brazilian Mineral Resources.** Henrique Capper Alves de Souza. *Engenharia, Mineracao e Metalurgia*, v. 26, Oct. 1957, p. 217-223.

(A11a)

318-A. (Portuguese.) **Present Conditions and Possibilities for Development of a Copper Industry in Brazil.** Justo Pinheiro da Fonseca. *Engenharia, Mineracao e Metalurgia*, v. 26, Oct. 1957, p. 224-226.

8 ref. (A-general; Cu)

319-A. (Portuguese.) **The Brazilian Manganese Problem.** Othon Henry Leonardos. *Engenharia, Mineracao e Metalurgia*, v. 26, Nov. 1957, p. 271-276.

Yearly figures on exports of Mn ores from 1900 to 1956; deposits currently known and being worked; importance of Mn to growing Brazilian steel industry. 13 ref. (A4; Mn)

320-A. (Portuguese.) **Present Condition of the Brazilian Lead Industry.** Joao R. Nunes. *Engenharia, Mineracao e Metalurgia*, v. 26, Dec. 1957, p. 349-353.

(A-general; Pb)

321-A. (Portuguese.) **The Brazilian Aluminum Industry.** Waldemar de Lima e Silva. *Engenharia, Mineracao e Metalurgia*, v. 26, Dec. 1957, p. 355-356.

(A-general; Al)

322-A. (Rumanian.) **The Presence of Germanium in Rumanian Ores.** J. Buzincu and M. Nicolaid. *Studii si Cercetari de Metalurgie*, v. 2, no. 1-2, 1957, p. 75-78.

(A11a; Ge, RM-n)

323-A.* (Russian.) **Metallurgical Characteristics of Boron Structural Steels.** O. N. Meshcherinova, L. I. Posysaeva and G. A. Khasin. *Stal'*, Jan. 1958, p. 75-81.

Melting technology utilizing Al and Ti for final deoxidation assures proper tempering, fine austenite grains, and good ductility and strength. Production of boron steel, properties of boron steels, grain size, physical properties. 4 ref. (A-general; AY, *B*)

324-A. (Russian.) **Some Problems Concerning Industrial Management.** I. E. Moshkevich. *Stal'*, Jan. 1958, p. 82-88.

(A5)

325-A. (Russian.) **Development of Iron and Steel Industry in China.** Goa Yan-Ven. *Stal'*, Jan. 1958, p. 91-93.

(A-general; ST)

326-A. (Russian.) **Conference on Coordination of Scientific Research in the Iron and Steel Industry.** M. A. Egorov. *Stal'*, Jan. 1958, p. 94-95.

(A9; ST)

327-A. (Spanish.) **The Veracruz Foundry Company, a Mexican Steel Plant.** Fernando Gonzalez V. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 207-220.

(A-general, D-general; ST)

328-A. (Spanish.) **Economic Future of the Electric Arc Furnace in Mexico.** W. B. Wallis. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 227-232.

(A4, D5; ST)

329-A. (Spanish.) **Glossary of Technical Terminology.** Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 298-308.

Definitions of accessories, raw materials, production operations and repairs with reference to blast furnaces, low-shaft furnaces, openhearth furnaces; electric furnaces and steelmaking processes.

(A-general; ST, 11-67)

330-A. (Spanish.) **Study of Spanish Ball Bearing Steels.** Mario Pujol Roig. *Revista de Ciencia Aplicada*, v. 12, Jan-Feb. 1958, p. 1-15.

Properties and structure of three types of steel having different C, Mn, P, S, Si, Cr, Ni, Cu and Mo contents; effects of addition of V; Jominy test; quenching in oil, water and brine; heat treatment and tables. 19 ref. (A-general, J-general; ST, SGA-c)

331-A. Manganese. L. Sanderson. *Canadian Mining Journal*, v. 78, Nov. 1957, p. 112-113.

(A-general; Mn)

332-A. Today's "Wonder" Metals. How They'll Look Tomorrow. Robert E. Hulse. *Chemical Processing*, v. 20, Dec. 1957, p. 32-35.

(A-general; Ti)

333-A. Heavy Rare Earths. E. E. Klicker and Adrian M. Gammill. *Chemical Processing*, v. 20, Dec. 1957, p. 38-41, 225.

(A-general; EG-g)

334-A. Recent Trends in Mineral Development in the U.S.S.R. and Western Europe. B. C. Roy. *Geological, Mining and Metallurgical Society of India, Bulletin*, no. 19, Mar. 1957, 56 p.

Discussion of geological surveys and mineral exploitation. (A4n)

335-A. (English.) **A Review of Iron and Steel Technique—Progress in 1957.** Takeshi Yamaoka. *Japan Science Review, Mining and Metallurgy*, v. 2, Mar. 1958, p. 99-107.

(A4, D-general, 10-54; ST)

336-A. (German.) **Bessemer Steels.** Alfred Kruger. *VDI Zeitschrift*, v. 99, Nov. 11, 1957, p. 1604-1610.

Production methods, types, properties and application fields. (A-general; ST-g)

337-A. (Italian.) **"Meehanite" Cast Iron, an Interesting Material for the Mechanical Engineer.** Alfredo Secciani. *Fonderia*, v. 7, Feb. 1958, p. 61-73.

Review of chemical and physical properties. 19 ref. (A-general, P-general, Q-general; CI)

338-A. (Japanese.) **Soviet Outlook for Pig Iron and Steel Production.** M. Yakata. *Metals*, v. 28, Apr. 1958, p. 251-254.

7 ref. (A4p; ST)

339-A. (Japanese.) **Soviet Special Steels. Heat Treatment Research.** M. B. Pridantsev. *Metals*, v. 28, Apr. 1958, p. 255-259.

(A-general, J-general, Q-general; ST)

340-A. (Japanese.) **Present State of Heat Resistant Alloys. Pt. 2.** S. Mitsubashi and R. Ida. *Metals,* v. 28, Apr. 1958, p. 306-310.

(A-general; SGA-h)

341-A. (Portuguese.) **ACESITA Begins Production of Silicon Plate.** *ABM-Noticiario,* v. 12, Mar. 1958, p. 1-3.

Companhia Acos Especiais Itabira (ACESITA) opened first plant for production of Si steel in Latin America on Oct. 23, 1957. Equipment, specifications of plate to be produced in first operations. Planned production is 12,000 tons per year.
(A-general, W10a; ST, *Si,* 4-53)

342-A. (Russian.) **Advances in Soviet Ferrous Metallurgy.** *Metallurg,* v. 3, Mar. 1958, p. 1-2.

Achievements and failures in fulfillment of 1957 Plan and perspectives for 1958. (A-general; ST)

343-A. (Russian.) **Mechanical Sealing of Blast Heater Burners.** B. I. Ginsburg, A. K. Vulykh, I. I. Liseenko and D. G. Klimenko. *Metallurg,* v. 3, Mar. 1958, p. 7-10.

Method of eliminating hazard created by accumulation of gas around burners. (A8a, W17g)

344-A. Stainless Steels and Heat Resisting Steels. *Aciers Fins & Speciaux,* no. 28, Mar. 1958, p. 102-113.

Tables of composition, heat treatment and physical and mechanical properties. (A-general, Q-general, R-general, SS, SGA-h)

345-A. The Aluminum Industry in India. A. Das Gupta. *Indian Minerals,* v. 11, Apr-June 1957, p. 101-110.

(A9; Al)

346-A. New Developments at Abbey Works, Steel Co. of Wales, Ltd. W. F. Cartwright. *Iron and Coal Trades Review,* v. 175, Dec. 20, 1957, p. 1419-1422.

(A5, ST)

347-A.* **Metallurgical Defects in High Speed Steels.** E. Niesielski. *Metallurgia,* v. 57, May 1958, p. 233-245.

With special reference to 18-4-1 and 6-5-4-2 types. Defects arising during the manufacture of the steel, during heat treatment of the tools and during processing.
(A-general; TS-m, 9)

348-A. Zirconium and Hafnium. Glen C. Ware. *U. S. Bureau of Mines Minerals Yearbook 1956,* Preprint, 1956, 9 p.

(A-general; Hf, Zr)

349-A. Suitability and Selection of Blast Furnace Slag for Manufacture of Road Ballast. Paul Huttemann. *Stahl und Eisen,* v. 77, Oct. 17, 1957, p. 1436-1442. (Iron and Steel Institute Translation no. 782.)

Previously abstracted from original. See item 51-A, 1958.
(A11c; RM-q)

350-A. (English.) **Metallurgy.** R. J. Forbes. *Metalen,* v. 13, Apr. 15, 1958, p. 129-133.

History of metallurgy in 16th, 17th, and 18th centuries. (Concluded.) (A2)

351-A. (French.) **The Mexican Iron and Steel Industry.** *Metallurgie et la Construction Mecanique,* v. 90, May 1958, p. 333, 335, 337, 339-340.

(A4, D-general; ST)

352-A.* (Portuguese.) **Pig Iron for the Production of Ductile Iron.** Horace A. Hunnicutt. *ABM, Boletim da Associacao Brasileira de Metais,* v. 14, Jan. 1958, p. 19-29.

Properties and characteristics of ductile iron; effects of chemical elements present in pig on formation of spheroidal graphite; suggested specification for pig suitable for production of ductile iron; notes on composition of Brazilian pig.
(A11a; CI-a, CI-r)

353-A.* (Russian.) **New Copper-Base Alloy.** K. I. Akimova and A. V. Kurdyumov. *Liteinoe Proizvodstvo,* v. 2, Feb. 1958, p. 10-12.

New casting alloy contains about 10% Ni and Al, up to 2% Mn, and up to 0.5% Fe; has favorable casting, mechanical and corrosion properties.
(A-general, E-general, Cu, *Al, Ni*)

354-A. (Russian.) **Removing Carbon Dioxide From Air in Foundries.** Z. V. Babayan. *Liteinoe Proizvodstvo,* v. 2, Feb. 1958, p. 13-14.

(A8a, A10d, E-general)

355-A. (Russian.) **New Heat Resistant Magnetic Alloys Alfenol and Thermenol.** *Metallovedenie i Obrabotka Metallov,* no. 2, Feb. 1958, p. 50-51.

6 ref. (A-general, P16, Q-general; Al, Fe, SGA-h)

356-A. (Russian.) **Relation Between Iron and Steel Production.** L. L. Zusman. *Stal',* v. 18, Apr. 1958, p. 358-363.

Apportionment of raw materials and equipment in gearing iron and steel production to meet nation's industrial needs. (A-general, A4p; ST)

357-A. (Book.) **Man, Metals and Modern Magic.** J. Gordon Parr. 1958. 238 p. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $2.95.

Metallurgical experience and knowledge from its beginnings more than 6000 years ago to the present. Practices in shaping Au and Ag, smelting, working, alloying and casting Cu and bronze, reduction of iron ore and production of wrought iron, cast iron and steel. Production and fabrication of Al, alloy steel, Ti, Mg and superalloys. (A2)

358-A. (Book.) **Transactions of American Society for Metals.** Ray T. Bayless, Ed. 1139 p. v. 50. 1958. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $10.

Contains 56 papers which were abstracted separately as preprints in 1957. (A-general)

359-A. (Book.) **Automation in Practice.** S. E. Rusinoff. 261 p. 1957. American Technical Society, Chicago, Ill. $6.50.

Survey of automation techniques as applied to various manufacturing and metalworking processes. Implications of automation: principles of the feedback control loop, basic devices for effecting hydraulic pneumatic, electric and electronic functions. Application to metalworking, metal cutting, pressworking, joining, heat treating, casting, metal production and systems of automatic inspection and control.
(A-general, 18-74)

360-A. (Book.) **Cost Finding in the Nonferrous Metals Industry.** 1957. 158 p. The British Nonferrous Metals Federation, Birmingham, England.

General principles, metal cost and computation of metal losses, expense classifications and allocation, depreciation, estimating and forecasting, cost computation, financial accounts. (A4s, E-general; EG-a38)

361-A. (Book.) **Statistics of the Iron and Steel Industry of Japan for 1957.** 92 p. 1958. Japan Iron and Steel Federation, Tekko Bldg., 1, Marunouchi Chiyoda-Ku, Tokyo.

(A4p; ST)

362-A. (Book.) **Concise International Dictionary of Mechanics and Geology.** English, French, German and Spanish. S. A. Copper. 400 p. 1958. Philosophical Library Inc., 15 East 40th St., New York 16, N. Y. $6.

Includes many metallurgical terms; each language separately indexed. (A-general, 11-17)

363-A. (Book.) **Titanium, the Industry, Its Future, Its Equities.** 100 p. 1957. F. S. Smithers & Co., 1 Wall St., New York 5, N. Y.

Properties, raw material sources, ore processing, Ti production processes, production economics; companies producing Ti metal, Ti markets and equities. 35 ref.
(A-general, Ti)

364-A. (Book—German.) **Gmelin's Handbook of Inorganic Chemistry. 8th Ed.. Calcium.** P. B2. Gmelin Institute. 392 p. 1957. Verlag Chemie, GmbH. Weinheim/Bergstr. Germany. $52.56.

Hydrides, oxides, hydroxides, peroxides and nitrogen compounds of calcium. (A-general, 11-68; Ca)

365-A. (Book—German.) **Gmelin's Handbook of Inorganic Chemistry. 8th Ed. System No. 60. Copper. Pt. Bl.** Gmelin Institute. 624 p. 1958. Verlag Chemie GmbH. Weinheim/Bergstr. Germany. $83.76.

Copper compounds with oxygen, nitrogen, the halogens, sulphur, selenium and tellurium.
(A-general, 11-68; Cu)

366-A. (Book—German.) **Gmelin's Handbook of Inorganic Chemistry. 8th Ed. Systematic Subject Index.** Gmelin Institute. 58 p. 1957. Verlag Chemie GmbH. Weinheim/Bergstr. Germany. $17.28.

Gmelin classification system.
(A-general, 11-68)

367-A. (Book—Spanish.) **Second National Congress of the Steel Industry,** Mar. 1957, Camara Nacional de la Industria Del Hierro y Del Acero, Av. Insurgentes 263, Mexico City 7, Mexico. 100 pesos.

Papers abstracted separately.
(A-general; ST)

B Ore and Raw Material Preparation

107-B. Effect of Roasting on Recovery of Uranium and Vanadium From Carnotite Ores by Carbonate Leaching. J. Halpern, F. A. Forward and A. H. Ross. *AIME Transactions,* v. 212, Feb. 1958, p. 65-70.

Effect of roasting carnotite ores in the presence of various reagents on subsequent recoveries of U and V by carbonate leaching. An attempt to account for the results in terms of the chemical reactions that occur during the roast treatment. 8 ref. (B15, C19n; U, V)

108-B. Sinter Roasting of Lead-Rich Galena Concentrates at the Electrothermic Lead Plant of the Ronnskar Works, Sweden. S. J. Wallden, N. B. Lindvall and K. G. Gorling. *AIME Transactions,* v. 212, Apr. 1958, p. 146-153.

New method and plant for pelletizing and sintering lead concentrates with 70-80% Pb contents. 7 ref. (B16, B15, Pb)

109-B.* **Production of Self-Fluxing Sinter.** J. S. McMahan. *Blast Furnace and Steel Plant,* v. 46, Apr. 1958, p. 373-376.

Adding 18% dolomite fines to the sinter mixture increased blast furnace production rate about 8½% and lowered coke rate about 6½%. Sinter plant production rates higher

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

when making dolomitic sinter. Dolomitic sinter more pliable and softer than regular sinter.
(B16a, D1; Fe, RM-n)

110-B. Appleby-Frodingham Sinter Plants. B. L. Robertson and R. H. Siddons. *Iron and Coal Trades Review,* v. 176, Mar. 28, 1958, p. 739-750.

Some important factors governing sinter plant performance. Fan operation and circulating load, for example, have been isolated and examined and a method of plant rating worked out. 5 ref.
(B16, W13e, D1a; Fe, RM-n)

111-B. Electric Furnace Refractories. E. C. Wright. *Metal Progress,* v. 73, May 1958, p. 87-88.

Refractory slurries are poured into forms around electrode parts; self-curing mixes are made with additions of silicon metal powder and sodium silicate whose reaction generates enough heat to set and dry the rammed refractory.
(B19, D5; RM-h)

112-B. Beneficiation of Uranium Ores by Flotation. John A. Jaekel. *Washington State Institute of Technology,* Technical Report 4, 1958, 8 p.
(B14h; U)

113-B. Importance of Stainless Scrap Segregation. T. J. Wayne. *Waste Trade Journal,* v. 104, Mar. 1958, p. 38-39.
(B23; SS)

114-B. Intensification of the Sintering Process by Burning Limestone on Top of Sinter Bed. Later Use of Resulting Lime in Sinter Mix. D. A. Kissin and A. V. Drimbo. *Stal',* v. 17, no. 10, 1957, p. 868-873. (Henry Brutcher, Altadena, Calif., Translation no. 4068.)

Previously abstracted from original. See item 47-B, 1958.
(B16a; Fe, RM-n)

115-B. Increased Sintering Rates Obtained by Modifying the Mixing Technique. A. E. Lebedev. *Metallurg,* v. 2, no. 5, 1957, p. 8. (Henry Brutcher, Altadena, Calif., Translation no. 4083.)

Previously abstracted from original. See item 92-B, 1957.
(B16a; Fe, RM-n)

116-B. Experiments on the Pressing of Refractories at High Temperatures. V. Ya. Riskin and V. V. Goncharov. *Ogeneupory,* v. 22, no. 4, 1957, p. 186-188. (Henry Brutcher, Altadena, Calif., Translation no. 4098.)
(B19)

117-B. (French.) **Thermodynamic Study of the Action of the Reagents in the Flotation of Ores.** Luigi Dobrescu. *Revue de Métallurgie (Bucarest),* v. 2, 1957, p. 129-144.

A theoretical discussion of such surface phenomena as the interaction of the flotation reagents with the ore surfaces, the wetting of the ores and the adhesion of ore particles to the air bubbles in the sludge that chiefly determine the process of flotation. 11 ref.
(B14h, P12, RM-n)

118-B. (German.) **Production of Aluminum From Nepheline.** N. Polutoff. *Aluminium,* v. 34, Apr. 1958, p. 192-193.

Volkhov Aluminium Works process of extracting alumina from nepheline concentrate (30% Al) involves comminuting with limestone and a series of wet grinding, filtering, carbonizing, washing and calcining. (B14; Al)

119-B. New Process for Heat Treating Iron Ore Concentrates. *Canadian Mining Journal,* v. 78, Nov. 1957, p. 98-99.
(B16b; Fe)

120-B. International Mineral Dressing Congress, Stockholm, Sweden, 1957. *Canadian Mining Journal,* v. 78, Nov. 1957, p. 100-105.
(B13, B14, B15, B16)

121-B. Tougher Taconite Pellets for Blast Furnaces. *Chemical Processing,* v. 20, Dec. 1957, p. 104-106.

Lower fuel and maintenance costs plus virtual elimination of pellet breakage are advantages cited in new process. (B16b; Fe)

122-B. Some Improvements in Sinter Plant Ignition. W. C. E. Bell. *Iron and Coal Trades Review,* v. 175, Nov. 8, 1957, p. 1093-1096.

Adoption of an ignition hood for coke oven gas firing and improvement in sinter quality which resulted. (B16a, 1-52; Fe)

123-B.* (German.) **Effect of Small Amounts of Alloying Components Forming Solid Solutions on Sinter Behavior.** F. Thümmler. *Planseeberichte für Pulvermetallurgie,* v. 6, Apr. 1958, p. 2-16.

Effect on sinter behavior of small amounts of Fe, Co, Cu and Ag, which form solid solutions. Sintering is hindered if the solid solution crystals are formed before sintering while it is aided if they are formed during sintering. Relations with the difference in atomic radii between the added and the base metals and improvement of mechanical properties. 22 ref. (B16, 2-60)

124-B. (Russian.) **Improvement of Lead Concentrates by Pyrometallurgical Treatment.** S. Mantya, J. Buzinku and N. Petrescu. *Revue de Metallurgie (Bucarest),* v. 2, 1957, p. 107-110.
(B15; Pb)

125-B. How Empresa Minera de Catavi Concentrates Tin Ores. Oscar Davila-Michel. *Engineering and Mining Journal,* v. 158, Nov. 1957, p. 100-106, 108.
(B14; Sn)

126-B. Recovery of High-Grade Iron Ore at Copper Cliff, Ont. Paul Queneau, E. H. Bracken and D. Kelly. *Foundry Trade Journal,* v. 104, May 15, 1958, p. 579-580.
(B14, B15, B16f; Fe)

127-B. The Urgency of Mineral Beneficiation and Extractive Metallurgical Techniques in India. *Indian Minerals,* v. 11, Apr-June 1957, p. 115-122.
(B14, C19)

128-B.* Liquefied Petroleum Gases for Controlled Atmosphere Production. L. G. W. Palethorpe. *Metallurgia,* v. 57, May 1958, p. 219-223.

Liquefied petroleum gases in the production of controlled atmospheres for heat treatment furnaces, and for such operations as clean hardening, carburizing, carbo-nitriding and bright annealing. (B25, J2k)

129-B.* Agglomeration Leaching of Uranium Ores. James W. Crosby. *Washington State Institute of Technology, Bulletin 241,* 1958, 30 p.

Ore is crushed to about 10-mesh, agglomerated with 100 g. per liter sulphuric acid, and leached in tanks by percolation. Initial acid strengths are controlled to furnish a terminal pH in the correct range for ion exchange extraction of the uranium. Effluent solutions are clear and require no additional filtration or settling. Recoveries in excess of 80% on ores which assay only 0.07% U_3O_8, or 90% with 0.13% U_3O_8 or better. 4 ref. (B14, C19n; U)

130-B. Smelting Trials With Swedish Ore Pellets. Alfred Reckmann and Walter Misch. *Stahl und Eisen,* v. 78, Jan. 9, 1958, p. 21-27. (Iron and Steel Institute Translation no. 865.)

Previously abstracted from original. See item 46-B, 1958.
(B16a, D1a; Fe, RM-n)

131-B.* (Portuguese.) **Sintering Operations at the Plant of Queiroz Junior S/A.** J. J. Carneiro de Mendonca. *ABM, Boletim da Associacao Brasileira de Metais,* v. 14, Jan. 1958, p. 31-40.

Continuous, rotary table equipment for sintering itabirite ore. Hourly production is about 8 tons per hr. Operational details, costs, product analysis. (B16, 1-52; Fe)

132-B. (Portuguese.) **Sinter Production Capacity in Installations Equipped With Intermittent Furnaces.** Tharcisio D. deSouza Santos. *ABM, Boletim da Associacao Brasileira de Metais,* v. 14, Jan. 1958, p. 41-52.
6 ref. (B16, 1-52)

133-B. (Russian.) **Pelletizing Iron Ore Concentrates and Iron Ore Fines.** F. M. Bazanov, F. F. Kolesanov, I. L. Malkin and S. I. Sharov. *Stal',* v. 18, Apr. 1958, p. 289-294.

Advantages of agglomerating iron ore concentrates and fines by method of pelletizing and burning of pellets on grates of sintering machine as compared to sintering.
(B16b; Fe, RM-n)

134-B. (Russian.) **Stability of Highly Magnetic Iron Oxides in Roasted Ores.** P. A. Tatsienko. *Stal',* v. 18, Apr. 1958, p. 295-297.

Investigation to determine types of ore to be used for reducing-oxidizing or reducing-calcination. 9 ref. (B15; Fe, RM-n)

135-B. (Spanish.) **Development of a Concentration Cycle for Gold Ore From the Moradito Mine in Culampaja.** Angel J. Martellota. *Facultad de Ciencias Quimicas, Universidad Nacional de la Plata, Revista,* v. 29, 1955-56, p. 71-77.
(B14; Au)

136-B. (Spanish.) **Contribution to the Study of Concentration of a Scheelite Ore.** Moisés R. Naon. *Facultad de Ciencias Quimicas, Universidad Nacional de la Plata, Revista,* v. 29, 1955-56, p. 95-100.
(B14; W)

C Extraction and Refining

163-C. Hafium-Zirconium Separation by Vapor Phase Dechlorination. J. W. Evans. *AIME Transactions,* v. 212, Feb. 1958, p. 55-56.
4 ref. (C28; Hf, Zr)

164-C. Interpretation of the Literature on the Mechanism of the Hall Process. John J. Stokes, Jr. *AIME Transactions,* v. 212, Feb. 1958, p. 75-79.

Electrolysis of Al from cryolite melts. Structure of the melts, density, freezing point. Theories of electrolysis. 18 ref. (C23, Al)

165-C. The Reduction of Cupric Salts in Aqueous Perchlorate and Sulfate Solutions by Molecular Hydrogen. E. R. Macgregor and J. Halpern. *AIME Transactions,* v. 212, Apr. 1958, p. 244-247.
21 ref. (C19; Cu)

166-C. Induction Melting Process for Titanium Scrap. P. J. Ahearn,

C. F. Frey and J. F. Wallace. *AIME Transactions,* v. 212, Apr. 1958, p. 274-276.

Method employs a permanent skull in the bottom of the graphite crucible and a high meniscus during the molten period and induction-melts Ti in graphite crucibles with less carbon contamination than reported to date. 9 ref. (C5j; Ti, RM-p)

167-C. Review and Appraisal of Vacuum Melting. Edward A. Loria. *Blast Furnace and Steel Plant,* v. 46, Apr. 1958, p. 379-384, 388.

Applications of vacuum melting to ferrous and superalloys; compares tensile strength properties of vacuum melted alloys with similar alloys melted in air. Principles, process variables, usual techniques in vacuum arc and vacuum induction melting. 6 ref. (C25, C5h, C5j, D8m, 1-73)

168-C. Switch to Solvent Hikes Uranium Recovery. *Chemical Week,* v. 82, Mar. 1958, p. 61-62, 64.

Advantages of solvent extraction over former phosphate precipitation process are saving in reagent costs, high degree of automation possible and much higher efficiency of uranium recovery. (C19; U)

169-C. Filtration and Vacuum Distillation Unit for the Purification of Alkali Metals. G. W. Horsley. *Journal of Applied Chemistry,* v. 8, Jan. 1958, p. 13-18.

6 ref. (C19n, C22h; EG-e)

170-C. Reactor-Grade Zirconium Metal. *Nuclear Power,* v. 3, Feb. 1958, p. 73-74.

Arc melting. (C5h, T11; Zr)

171-C. NH$_4$F — Versatile Reagent for Zirconium Fuels. A. T. McCord and D. R. Spink. *Nucleonics,* v. 16, Feb. 1958, p. 94-104.

Scrap recovery. (C19n, A8d; Zr)

172-C. Distillation of Liquid Metal (Bismuth) Reactor Fuel. F. S. Martin and R. E. Brown. United Kingdom Atomic Energy Authority, AERE C/R 2391, 1957, 14 p.

Distillation of Bi from alloys containing Mg, Zr, U and fission products. 10 ref. (C22; Bi, *Mg, U, Zr*)

173-C. Influence of the Nature of the Gas Phase on the Anode Effect in the Electrolysis of Cryolite. Alumina Melts. A. I. Belyaev, E. A. Zhemchuzhina and A. D. Gerasimov. *Journal of Applied Chemistry of the USSR,* v. 29, no. 12, (1957), p. 1979-1983. (Translation by Consultants Bureau, Inc.)

4 ref. (C23n; Al)

174-C. Mechanism of Formation of Zirconium Sponge in Zirconium Production by the Magnetothermic Process. F. G. Reshetnikov and E. N. Oblomeev. *Soviet Journal of Atomic Energy,* v. 2, no. 5, 1957, p. 561-564. (Translation by Consultants Bureau, Inc.)

Growth of the Zr sponge on the wall of the reaction crucible above the level of the molten bath is the result of the reaction of zirconium chloride vapor with molten Mg as the latter ascends by capillary action through the previously formed sponge. The amount of zirconium chloride reacting with Mg in unit time depends more upon the perimeter of the crucible than upon the surface area of the bath. It is recommended that partitions be placed in the crucible to act similarly to the crucible wall. 7 ref. (C26; Zr)

175-C. (English.) Contribution to the Utilization of Pyrites With Low Content of Gold in the Rumanian People's Republic. G. Vanci and Gabriela Maltezeanu. *Revue de Métallurgie (Bucarest),* v. 2, 1957, p. 113-128.

The Au from pyrites with low Au content (4 to 15 g. per ton Au) can be economically extracted by the cyanide process after previous roasting at 600-700° C. With greater Au content (15 to 40 g. per ton) a two-stage cyanide process can be economically utilized. 3 ref. (C19p; Au)

176-C.* Preparation of Plutonium-Aluminum Alloys. O. J. C. Runnalls. *Atomic Energy of Canada Ltd., Chalk River Project,* AECL no. 458, June 1957, 17 p.

Direct reduction of PuF_3 and PuO_2 with liquid Al. PuF_3 is reduced more rapidly at 900° C. than at 1100° C. with liquid Al, owing to the evolution of gaseous AlF, which is stable at the former temperature. Yield for this process averaged 95% in alloying 337 g. of Pu. Alloys for a second fuel rod were prepared by the Al reduction of a pressed PuO_2-cryolite mixture at 1100° C., with a Pu yield of 98%. 7 ref. (C26; Pu, *Al*)

177-C. Atomic-Age Metal Extraction. L. W. Coffer. *Chemical Engineering,* v. 65, Jan. 1957, p. 107-122.

Chemical engineering techniques, much ignored in metal production, now solve tough corrosion, erosion, high-temperature problems in a host of new processes for making "difficult" metals. 34 ref. (C-general)

178-C. Electrolysis of Ferrous Chloride Solutions With Special Reference to Extraction of Metals and Sulphur From Sulphide Ores. V. Arvamuthan. *India Section, Electrochemical Society, Bulletin,* v. 6, July 1957, p. 49-50, 62.

(C23n)

179-C. Plutonium Recycling With Molten UF$_4$. Archie G. Buyers. *Nucleonics,* v. 15, Nov. 1957, p. 100-103.

Plutonium transfer from spent to fresh uranium fuel by oxidation into molten UF_4 and reduction of the fluoride mixture to U-Pu alloy has been successfully accomplished. Scaled up, the process is calculated to yield 85% of the Pu. Final alloy should contain 15-35% of the rare earths and < 10% of other fission products. Suggested applications are to the sodium graphite reactor and enriched-core fast-breeder fuel cycles. 5 ref. (C28j; Pu, U)

180-C. Method for the Separation of Plutonium From Uranium. E. Haeffner and A. Hultgren. *Nuclear Science and Engineer,* v. 3, May 1958, p. 471-481.

A chromatographic method with possibilities for use on a larger scale. 5 ref. (C28; Pu, U)

181-C.* (English.) Studies on Electrolytic Refining of Zinc. Pt. 4. Process of Inclusion of Lead in Cathode Zinc. Motoo Watanabe and Seitaro Fukushima. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 10, Apr. 1958, p. 120-132.

Contamination of cathode Zn by the ionic deposition of Pb in solution and the occlusion of lead peroxide particle in suspension under identical conditions. (C23p, 3-69; Bn, *Pb*)

182-C. (French.) Method for Verifying the Purification of Aluminum by Molten Zone Refining. F. Montariol. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 63-67.

Zone melting processes; tracer-testing of purity; low-temperature conductivity testing. 4 ref. (C28k, P15g, S19; Al-a)

183-C.* (French.) Separation of Rare Earths With Ethylenediamine-Tetraacetic Acid. Pt. 7. Cyclic Process for Fractionation of Cerium Earths. G. Brunisholz and R. Cahen. *Helvetica Chimica Acta,* v. 41, Fasc. 2, 1958, p. 460-467.

Details of process, materials used. Data on separating agents rejected as inefficient. (C28; EG-g, Ce)

D Iron and Steelmaking

210-D. Equilibria of Molten Iron and Liquid Slags of the System CaO-SiO$_2$-FeO$_1$. H. L. Bishop, Jr., N. J. Grant and J. Chipman. *AIME Transactions,* v. 212, Apr. 1958, p. 181-192.

Lime and dicalcium silicate crucibles were equilibrated with molten iron and liquid slags containing iron oxide and small amounts of sulphur. Oxygen content of metal, iron oxide activities and desulphurization values of the slags were determined in the temperature range 1530 to 1700° C. Influence of magnesia in the slag and the temperature dependence of the solubility of lime in liquid iron oxide and the ferric oxide content were established. 17 ref. (D11n, D2d, P12, Fe)

211-D. The Behavior of Chromium in Slag-Metal Systems Under Reducing Conditions. C. W. McCoy and W. O. Philbrook. *AIME Transactions,* v. 212, Apr. 1958, p. 226-235.

Reduction of chromous oxide from lime-silica-alumina slags by carbon-saturated iron behaves as a first-order process substantially independent of slag composition and temperature over an important range for iron smelting. 16 ref. (D11n, ST, *Cr*)

212-D. Russian Experience With 500-Ton Open Hearth Furnaces. R. Sewell. *Blast Furnace and Steel Plant,* v. 46, Apr. 1958, p. 50-52.

(D2, W18r)

213-D. New Trends in Firing Practices for Open Hearth Furnaces. James E. Goodin. *Blast Furnace and Steel Plant,* v. 46, Apr. 1958, p. 389-390.

Experiences and results using high-pressure natural gas to replace steam as atomizing agent in open-hearth furnaces; safety equipment. (D2, W18r; RM-m)

214-D. Gary Works' Experiences With Quartzite Blow-Outs. R. E. Turman and T. A. Young, Jr. *Blast Furnace and Steel Plant,* v. 46, Apr. 1958, p. 391-395.

Experiences with three quartzite-type blast furnace blow-outs illustrate advantages. Conditions for satisfactory quartzite blow-outs are: quartzite burden interface occurring above the mantel: 20% reduction of burden in advance of lowering blast temperature to 600° F.; filling sequence to maintain quartzite at correct level; quartzite temperatures measured and maintained below 2500° F.; quartzite particle size

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

ranging from 1 to 2 in. with minimum of fines. (D1, W17g)

215-D. Use of Oxygen in the British and European Steel Industries. D. J. O. Brandt. *Iron and Coal Trades Review,* v. 176, Jan. 1958, p. 263-271.

18 ref. (D-general, D10; ST, *O*)

216-D. Titanium-Bearing Stainless Steel. Slag Washing Process. *Iron and Coal Trades Review,* v. 176, Mar. 28, 1958, p. 751.

As molten stainless steel flows through the high-temperature slag, a washing action is developed, and this cleans the steel of any contaminants. When the molten steel rises in the mold, the slag forms a protective covering over the entire surface preventing air oxidation. The extremely hot slag also retards the rate of solidification, allowing any remaining contaminants to float to the top where they can be discarded. (D11n; SS, *Ti*)

217-D.* High-Phosphorus Pig Iron Refined With Lime and Oxygen. B. Trentini and M. Allard. Digest of paper presented before the 15th annual A.I.M.E. Electric Furnace Steel Conference, Feb. 1958. *Metal Progress,* v. 73, May 1958, p. 145-146, 148.

It is now possible to produce steel from high-phosphorus pig iron by the basic oxygen process. When lime powder is injected along with oxygen blast, the phosphorus is fluxed away and the steel is fully equivalent to that produced in the openhearth. (D3b; ST)

218-D.* Modern Trends in Iron and Steel Making. E. Klein. *South African Mechanical Engineer,* v. 7, Feb. 1958, p. 203-224.

Increase in iron production by larger number of units, larger units, better exploitation of existing units; physical burdening, high top pressure. Ore agglomeration by sintering and pelletizing; ore bedding; upgrading of ore by beneficiation; heavy media separation, cyclone; roasting and magnetic separation; enriched blast; low-shaft furnace. Steelmaking pneumatic processes, new concepts through application of oxygen; L. D., Graef Rotor and Kaldo process; electric arc furnace; openhearth process. (D-general)

219-D. Study of the Effects of Vacuum Melting on 550° F. Tempering Embrittlement. M. Gensamer. Columbia University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131358, Jan. 1957, 41 p. $1.25.

At 550° F., temper embrittlement, common in alloy steel, can be eliminated in SAE 1340 through purification by vacuum melting in a system embodying the principles of the molecular still. (D8m, Q26s; ST)

220-D. Use of Compressed Air for a Sharper Flame in the Openhearth Furnace. M. G. Kozhanov and G. B. Rogov. *Metallurg,* v. 1, no. 7, 1956, p. 18-21. (Henry Brutcher, Altadena, Calif., Translation no. 3916.)

(D2g, D2h)

221-D. Effect of Increased Top Pressure in Blast Furnace Upon Composition of Pig Iron Produced. V. L. Pokryshkin. *Stal',* v. 17, no. 6, 1957, p. 487-492. (Henry Brutcher, Altadena, Calif., Translation no. 4052.)

(D1h, 3-74; CI-a)

222-D. Possibilities of Producing Sponge Iron in Batch-Type Chamber Furnaces. (Coke Ovens.) M. S. Kurchatov. *Neue Hütte,* v. 2, no. 11, 1957, p. 671-678. (Henry Brutcher, Altadena, Calif., Translation no. 4085.)

Production of dense strong sponge iron by reduction of hematite, magnetite or brown ores of various reducibilities with several kinds of solid fuel (wood charcoal, bituminous coal, coke, lignite, anthracite). Quality of sponge iron obtained as function of proportion of ore in mix. (D8j; Fe, 6-74)

223-D. Fluxed Sinter With an Increased Magnesia Content. A. I. Gamayurov and A. G. Neyasov. *Stal',* v. 17, no. 1, 1957, p. 20-24. (Henry Brutcher, Altadena, Calif., Translation no. 4087.)

Previously abstracted from original. See item 329-D, 1957. (D1a, B16a; Fe)

224-D. Ferrocoke and Ore-Coal Briquets. M. S. Kurchatov. *Stal',* v. 17, no. 2, 1957, p. 103-105. (Henry Brutcher, Altadena, Calif., Translation no. 4090.)

Previously abstracted from original. See item 335-D, 1957. (D1a; Fe)

225-D. Injection of Powdered Coal Into Blast Furnace Hearth. V. I. Loginov. *Stal',* v. 16, no. 8, 1956, p. 675-682. (Henry Brutcher, Altadena, Calif., Translation no. 4092.)

Theoretical considerations about the possibilities and advantages of lowering the coke rate in blast-furnace operation by blowing powdered coal directly into the hearth zone through the tuyeres. (D1c; RM-j43)

226-D. Elimination of Copper From Molten Pig Iron. K. Ueno. *Tetsu to Hagane,* v. 43, no. 3, 1957, p. 265-266. (Henry Brutcher, Altadena, Calif., Translation no. 4101.)

Laboratory study of conditions under which sodium sulphide or sulphate can be used for removing residual Cu from pig iron. (D2b; *Cu,* Fe)

227-D. Trials With Ferrocoke in the Blast Furnace. Y. Shiraishi. *Tetsu to Hagane,* v. 43, no. 3, 1957, p. 351-352. (Henry Brutcher, Altadena, Calif., Translation no. 4102.)

(D1a; RM-j43)

228-D. Production Experience With Transformer Steel E 320. G. M. Borodulin. *Metallurg,* v. 1, no. 3, 1956, p. 14-16. (Henry Brutcher, Altadena, Calif., Translation no. 4129.)

Previously abstracted from original. See item 210-D, 1956. (D5; ST)

229-D. Importance of Vacuum Casting of Steel to Industrial Practice. Pt. 2. Z. Eminger, F. Kinsky and Z. Kletecka. *Hütnicke Listy,* v. 12, no. 8, 1957, p. 755-768. (Henry Brutcher, Altadena, Calif., Translation no. 4139.)

Previously abstracted from original. See item 21-D, 1958. (D9, 1-73; ST)

230-D. Influence of Pouring (Ladle) Refractories on the Formation of Macro and Micro Inclusions in High-Carbon Chromium Steel. Pt. 1. Y. Kotani. *Tetsu to Hagane,* v. 43, no. 9, 1957, p. 89-90. (Henry Brutcher, Altadena, Calif., Translation no. 4155.)

(D9, 9-69; SS-a, RM-h)

231-D. Reduction of Lump Ores by Gas From the Blast-Furnace Bosh Zone. Y. Takahashi. *Tetsu to Hagane,* v. 43, no. 9, 1957, p. 1015-1017. (Henry Brutcher, Altadena, Calif., Translation no. 4156.)

Laboratory tests of ores and sinters for reducibility conducted under conditions simulating actual blast furnace operating conditions. (D1a; RM-n)

232-D. Production of Structural Steels in Arc Furnace With a Very Short Oxidizing Stage. F. P. Edneral and N. F. Khlystov. *Stal',* v. 18, no. 1, 1958, p. 43-48. (Henry Brutcher, Altadena, Calif., Translation no. 4165.)

(D5; ST, SGB-s)

233-D. Economic Evaluation of Steelmaking Processes. R. V. Bregman. *Stal',* v. 17, 1957, p. 268-272. (Iron and Steel Institute Translation no. 541.)

Previously abstracted from original. See item 249-D, 1957. (D3, D2, 17-3; ST)

234-D. Prospects for Use of Calculating Machines for Automatic Control of Blast Furnace Running. I. A. Rylov. *Stal',* no. 6, 1957, p. 488-493. (Iron and Steel Institute Translation no. 653.)

Previously abstracted from original. See item 294-D, 1957. (D1, X14, 1-52)

235-D. The Effect of Impurities in Steel on the Magnetic Reversal Losses in Hot Rolled Transformer Plate. Theodor Bruggemann. *Neue Hütte,* v. 2, July 1957, p. 404-409. (Iron and Steel Institute, Translation no. 947.)

Previously abstracted from original. See item 276-D, 1957. (D-general, F23, P16; ST, 4-3)

236-D. (French.) Continuous Primary Purification of the Molten Iron in the Runner of a Blast Furnace by Blowing Pure Oxygen Through Porous Slabs. P. Leroy and R. Simon. *Publications de l'Institut de Recherches de la Sidérurgie,* Series A, no. 172, Dec. 1957, 20 p.

Sufficiently high oxygen densities for required purification can be used without danger of breakdown of the cement slabs or the appearance of red smoke. (D1h)

237-D. (French.) Sulphur Absorption Capacity and Constitution of Blast Furnace Slags in the Liquid State. Traian T. Negrescu. *Revue de Métallurgie (Bucarest),* v. 2, 1957, p. 5-50.

Quantitative relations for the ionic groupings that arise in a mass of molten silicates. Constitution and formation kinetics of several of these ionic groupings of liquid solutions, of which all molten metallurgical slags are constituted, are traced along general lines. 35 ref. (D11n, N14; RM-q)

238-D.* (French.) Some Physicochemical Aspects of the Corrosion of Refractory Materials. (Conclusion.) G. van Gijn. *Silicates Industrielles,* v. 23, Mar. 1958, p. 137-139.

Effect in steelmaking of a liquid slag on a porous solid and on a refractory. 30 ref. (D11, ST, RM-h, RM-q)

239-D.* (Japanese.) Measurement of Gas Temperature in Blast Furnace Operation and Its Utilization. Masamoto Nose and Kenichi Kasai. *Sumitomo Metals,* v. 9, Oct. 1957, p. 196-206.

Measurement of temperature, analysis and velocity continuously provides effective control. A German-type gas sampler was employed. Mechanism and operating methods; relation between CO and CO_2 content and gas temperature; temperature classification of gas distribution, ideal, normal and abnormal; influence of size and kind of charged material on gas distribution; estimation of permeability by measuring pressure. (D1b, S18q)

240-D. (Rumanian.) **Desulphurizing Power of Blast Furnace Slags. Sulphur Absorption Capacity of the Slags of the System SiO_2-CaO-FeO in the Liquid State at 500° C.** Traian T. Negrescu. *Studii si Cercetari de Metalurgie*, v. 2, no. 1-2, 1957, p. 37-68.

19 ref. (D1, D11n; Fe, *S*)

241-D. (Rumanian.) **Desulphurizing Power of Blast Furnace Slags. Pt. 6. Sulphur Absorption Capacity of the Slags of the System SiO_2-CaO-MnO in the Liquid State at 1425° C.** Traian T. Negrescu. *Studii si Cercetari de Metalurgie*, v. 2, no. 3, 1957, p. 265-288.

7 ref. (D1, D11n; *S*)

242-D.* (Russian.) **Improved Blast Furnace Charging Bell.** Yu. A. Popov, K. G. Umrikhin and A. K. Shaposhnikov. *Stal'*, Jan. 1958, p. 7-14.

Charging bell meets all operational requirements and has the following advantages: spreads the charge concentrically according to size and chemical composition; maintains continuous radial distribution; avoids necessity of sealing the rotary distributor; simplifies furnace management; increases production and lowers coke consuption. (D1a, 1-52)

243-D. (Russian.) **Smelting of Low-Manganese Iron From Krivoy Rog Ore With Donetz Coke.** P. G. Glazkov, N. E. Dunaev, A. G. Kuzub and G. A. Panev. *Stal'*, Jan. 1958 p. 14-20.

Effective smelting of low-manganese iron depends on the tenor of the Mn ore, production of slag with correct composition, the use of metal additives, Mn content of the cast iron and basicity of the slag. To hold sulphur within acceptable range the basicity of the final slag was increased by raising its alumina content to 8.5% and that of magnesia to 2.5%. 7 ref. (D1, D11n; Fe, *Mn*)

244-D.* (Russian.) **The Quality of Steel Produced From Cast Iron Smelted With Constant Moisture Air Blast.** M. I. Kolosov, A. N. Morozov, A. I. Stroganov, Yu. A. Popov, O. Ya. Vainshtein and N. V. Keis. *Stal'*, Jan. 1958, p. 24-27.

Introduction of constant moisture air blast in the production of high-quality steel did not cause undesirable increase in hydrogen content nor tendency toward cracking. Macrostructure and physical properties of the steel produced do not depend on the method of smelting. 6 ref. (D1)

245-D.* (Russian.) **Production of Tube-Steel by the Scrap Process From Low-Manganese Cast Iron With Different Manganese Content in the Melt.** A. I. Pastukhov, K. M. Petrov and A. M. Danilov. *Stal'*, Jan. 1958, p. 28-34.

Experimental results proved the necessity of maintaining the required Mn content in the melt during the entire heat in place of the usual addition of ferromanganese. Speed of burning out carbon, desulphurization and dephosphorization of the metal, chemical content of the slag, gas and nonmetallic inclusions in the metal and its phyical properties. 21 ref. (D2, D9r; ST)

246-D.* (Russian.) **Production of Ball-Bearing Steel in Acid Openhearth Furnace Fired With Natural Gas Mixed With Fuel Oil.** A. A. Kiselev, M. P. Lapshova and M. N. Kul'kova. *Stal'*, Jan. 1958, p. 35-40.

Shifting the production of ball-bearing steel, ShX 15, to openhearth furnaces fired with fuel oil-enriched natural gas resulted in greater purity of the metal and reduced the interval between tappings to 35 min. Technical factors affecting contamination of steel, nature and content of nonmetallic inclusions. (D2, 1-64; ST, SGA-c, RM-k, RM-m)

247-D.* (Russian.) **Intensification of Oxidizing Period in Electric Furnace Melting of Structural Steel.** F. P. Edneral and N. F. Khlistov. *Stal'*, Jan. 1958, p. 43-48. (Also Henry Brutcher, Altadena, Calif., Translation no. 4165.)

The oxidizing period was reduced by 30% with injection of oxygen at the end of the period to assure proper dephosphorization and decarbonization. It is recommended that the basicity of the slag in the melt be less than 2.2, and the heat of the metal 1500° C. (D5c; ST, SGB-s)

248-D. (Spanish.) **Processes Used in Direct Iron Ore Reduction.** Eduardo Aguilar. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 101-109.

(D8j, Fe)

149-D. (Spanish.) **Sponge Iron Use in a Low-Shaft Blast Furnace in Mexico.** J. W. Ehrenberg. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 183-188.

Kombinat steel plant; processes; advantages and disadvantages of use of sponge iron. Production of sponge in rotating blast furnace using iron ore with 0.46% Al_2O_3, 0.50% CaO and 0.017% S. Construction and operation of a rotating blast furnace. Low-blast furnace installation. (D8n, W17g, W17h; Fe, 6-74)

250-D. (Spanish.) **Heating a New Roof in an Openhearth Furnace.** M. Dominguez S. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 221-225.

(D2, W17r; NM-h)

251-D. (Spanish.) **Electrical Production of Pig Iron and Steel.** Charles G. Dauchat. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 251-260.

Thermal blast furnace and comparison with low-shaft furnace; production costs; process in openhearth furnace. 8 ref. (D8n, D5, W17; Fe, ST)

252-D. (Spanish.) **Scrap Substitution in Steel Melting.** C. B. Schmidt. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 267-269.

(D-general; RM-p)

253-D. Exothermics Raise Ingot Yields. Pt. 2. Drop-In Feeders. G. N. Cherry. *British Steelmaker*, v. 25, May 1958, p. 141-147.

(D9k; W19e)

254-D. Increasing Blast-Furnace Smelting Rates. Russian Practices. R. Sewell, Translator. *Iron and Coal Trades Review*, v. 175, Nov. 8, 1957, p. 1075-1077. (From *Metallurg*, Aug. 1957.)

(D1)

255-D.* Direct Reduction Is Closer. *Steel*, v. 142, Mar. 17, 1958, p. 102, 104, 107.

The R-N Process for direct reduction of iron ore. Two different products are made. One is a high-grade product containing more than 90% metallic iron and less than 3% silica. The other is a standard product (80-85% metallic iron, 4-8% silica) which is roll-pressed into peach-seed briquets for blast furnace feed. (D8j; Fe)

256-D. (French.) **Current British Practice in Operation of Martin Furnaces Equipped With Gas Producers.** G. Husson. *Institut de Recherches de la Siderurgie (IRSID), Publications*, Ser. B, no. 32, Apr. 1957, 18 p.

Report of visit to three plants. Furnaces, gas producers, control equipment. (D2, W18r; ST)

257-D. (Russian.) **Use of Manganese in Scrap Iron Process.** E. D. Akol'tsev and V. B. Kaplun. *Metallurg*, v. 3, Mar. 1958, p. 11-13.

(D2a; ST, *Mn*, RM-p)

258-D. (Russian.) **Deoxidation of Low-Alloy Steels.** I. M. Leikin. *Metallurg*, v. 3, Mar. 1958, p. 13-16.

By increasing the proportion of Mn in relation to Si and by lessening the Al content, the oxide inclusions in steel diminish. (D11r; AY, *Al*, *Mn*)

259-D. (Russian.) **New Arrangement for Pouring Liquid Steel Through a Vacuum.** G. A. Sokolov and G. N. Oiks. *Metallurg*, v. 3, Mar. 1958, p. 16-21.

Pouring steel from induction furnace into evacuated ladle accelerates removal of gases from melt. (D9m, D9p, D9s, 1-73; ST)

260-D.* Electric Smelting of Iron Ore. K. Sandvold, F. C. Collin and J. Gundessen. *Iron and Coal Trades Review*, v. 176, May 9, 1958, p. 1099-1101.

Smelting in 70,000-kw. electric furnace with the purpose of utilizing electric power with poor grades of fuel. The charge consists of lumps of ore (either high or low-grade) and the carbonaceous reducing agent. Best results are obtained by using sintered magnetite with crushed limestone in Tysland-Hole furnace. (D8n, W17j)

261-D. New Methods of Ironmaking. Effect of Coke and Scrap Shortage. Hermann Schenck. *Iron and Coal Trades Review*, v. 175, Dec. 13, 1957, p. 1363-1364. (From technical supplement of *Handelsblatt*, Oct. 25, 1957.)

(D1a, D2a, D8p, D8j; RM-p, RM-j43)

262-D. Smelting of Basic Pig Iron Using Oxygen-Enriched Blast. I. P. Bardin. *Stal'*, Aug. 1957, p. 673-684. (Iron and Steel Institute Translation no. 694.)

Previously abstracted from original. See item 60-D, 1958. (D1h; CI-a)

263-D. Determination of the Variables Affecting the Yield of Rimming-Type Free-Cutting Steel. Leo Heinen and Alfred Latour. *Stahl und Eisen*, v. 77, Sept. 5, 1957, p. 1204-1209. (Iron and Steel Institute Translation no. 696.)

Previously abstracted from original. See item 22-D, 1958. (D9p, 2-60; ST-d, *Mn*, *S*)

264-D. Operation of a Blast Furnace With a Top Gas Pressure of Up to 1.1 Atmospheres. V. P. Onoprienko and B. N. Starshinov. *Stal'*, Sept. 1957, p. 772-778. (Iron and Steel Institute Translation no. 718.)

Previously abstracted from original. See item 61-D, 1958. (D1h)

265-D. Investigations on Converter Smoke With a View to Spectroscopic

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

Control of the Basic Bessemer Process. Franz Wever. *Stahl und Eisen*, v. 77, Oct. 17, 1957, p. 1451-1459. (Iron and Steel Institute Translation no. 772.)

Previously abstracted from original. See item 24-D, 1958. (D3, S11k)

266-D. Behavior of Hydrogen in the Blowing of Steel in the Oxygen-Steam Converter Process. Herbert Neuhaus. *Stahl und Eisen*, v. 77, Dec. 26, 1957, p. 1863-1867. (Iron and Steel Institute Translation no. 810.)

Previously abstracted from original. See item 91-D, 1958. (D3, S11r; ST, *H*)

267-D. Desulphurization in the Basic Openhearth Process. Karl-Georg Speith. *Stahl und Eisen*, v. 78, Jan. 9, 1958, p. 27-34. (Iron and Steel Institute Translation no. 823.)

Previously abstracted from original. See item 92-D, 1958. (D2d, D10n; ST, *S*)

268-D. Soviet Blast-Furnace Production. I. A. Nekrasov. *Stal'*, Nov. 1957, p. 965-968. (Iron and Steel Institute Translation no. 833.)

Previously abstracted from original. See item 78-D, 1958. (D1, A4p; ST)

269-D. The (Basic) Hot-Blast Cupola, Openhearth Steel Plant and the L. D. Crucible Combined in One Unit. Adolf Richter, Georg Cohen and Paul Jacobi. *Stahl und Eisen*, v. 78, Mar. 6, 1958, p. 273-284. (Iron and Steel Institute Translation no. 901.)

Previously abstracted from original. See item 145-D, 1958. (D2, D10a, 1-65; ST)

270-D. The Decarburizing Reaction in the Basic Steel Converter During Dephosphorization. Heinz Pottgiesser. *Stahl und Eisen*, v. 78, Mar. 6, 1958, p. 291-298. (Iron and Steel Institute Translation no. 903.)

Previously abstracted from original. See item 146-P, 1958. (D3, 1-65; ST)

271-D. Effect of Electric Inductive Agitation of the Bath on the Metallurgical Reactions in the Electric Arc Furnace. Karl-Georg Speith, Hans vom Ende and Wolfgang Schneider-Milo. *Stahl und Eisen*, v. 78, Feb. 20, 1958, p. 215-220. (Iron and Steel Institute Translation no. 906.)

Previously abstracted from original. See item 144-D, 1958. (D5f)

272-D.* (German.) **Investigations on the Formation of Inclusions During Deoxidation With Silicon.** Wilhelm Anton Fischer and Manfred Wahlster. *Archiv für das Eisenhüttenwesen*, v. 29, 1958, p. 1-9.

Steel was melted in high-frequency furnaces. Specimens taken before and after silicon addition were investigated metallographically and the nonmetallic inclusions were separated electrochemically. Immediately after silicon addition primary inclusions high in SiO_2 were observed, which corresponded to the immiscibility gap in the system FeO-SiO_2. 9 ref. (D11r, D5; ST, 9-69, *Si*)

273-D.* (German.) **The Rotor Process.** Edgar Spetzler. *Neue Hutte*, v. 3, Feb. 1958, p. 85-93.

Oxygen is blown into a slowly rotating drum which is filled with pig iron, limestone and iron ore. Phosphorus content reduced to 0.02%; sulphur, nitrogen and oxide contents also low. (D10c)

274-D. (Russian.) **Physical Chemical Basis of Steel Production.** B. V. Lunchevskii. *Academy of Sciences of the USSR, Journal*, v. 9, 1957, p. 119-121.

(D11)

275-D. (Russian.) **Desulphurization of Pig Iron.** M. I. Gromov, L. M. Tsylev, A. M. Kakunin, V. I. Kotov and V. N. Kaporulin. *Metallurg*, v. 3, Mar. 1958, p. 3-6.

Use of electrolysis in vacuum and electromagnetic mixing of melt. (D8m, D11s; CI-a)

276-D.* (Russian.) **Use of Iron Ore Briquettes in Reduction of High-Phosphorous Iron in Openhearth.** M. T. Bul'skii, F. F. Sviridenko and N. T. Berilov. *Stal'*, v. 18, Apr. 1958, p. 303-306.

Replacement of deficient openhearth lump iron ores with briquettes of pulverized iron-rich ores or iron ores mixed with limestone, accelerates the process of desulphurization and reduces the tap-to-tap time (provided that the briquettes charged into the furnace are intensively heated). (D2a, B16d, Fe)

277-D. (Russian.) **Use of Highly Basic Sinter in Melting Phosphorous Iron in Openhearth.** I. V. Raspopov, Ya. S. Gorbanev and F. F. Sviridenko. *Stal'*, v. 18, Apr. 1958, p. 306-311.

Reduces melting time, increases productivity of furnace, improves quality of slag as fertilizer and cuts down consumption of high-grade ores. 4 ref. (D2a)

278-D. (Russian.) **Gas Heating of Ingot Heads.** K. N. Konovalov, N. K. Korneva, M. P. Danilov, L. I. Teder, T. T. Drobyazko and A. S. Shtepa. *Stal'*, v. 18, Apr. 1958, p. 311-316.

Use of specially designed burner for gas heating of ingot heads increased output of acceptable billets by 5-7% as a result of reduction of head crops. 7 ref. (D9, 1-52)

279-D. (Russian.) **Effectiveness of Various Methods of Heating Ingot Heads.** *Stal'*, v. 18, Apr. 1958, p. 319-323.

(D9)

Foundry

392-E.* **Note on the Use of Aluminum for the Deoxidation of Palladium and Its Alloys.** R. N. Rhoda and R. H. Atkinson. *AIME Transactions*, v. 212, Feb. 1958, p. 113-115.

Improved technique is especially suitable for use in making small castings with an induction melting and casting machine. Effect of various crucible linings on the efficiency of the residual deoxidizer and accompanying oxide film in protecting Pd against oxidation during remelting; the preferred crucible lining consists of zirconia cement. (E10b, 1-69; Pd, *Al*, AD-r)

393-E.* **Some Practical Experiences in Making Molds in a Mechanized Foundry.** H. Pinchin. *British Foundryman*, v. 51, Apr. 1958, p. 182-193.

Preparation of molds rammed entirely by slinging from the same sand system consisting of AFS 100 naturally bonded sand. Plant layout, molding boxes and green sand cores. (E19a, E21; 18-67, 18-74)

394-E.* **The Purification of Cast Iron by Oxidation.** R. H. T. Dixon. *British Foundryman*, v. 51, Apr. 1958, p. 197-203.

Impurities in cast iron removed by oxidation of the melt. Si, Mn, Ti, Pb, Cr, Ni, Cu and Al removed with low loss of carbon but Sn proved to be resistant to oxidation. P and S also eliminated by the use of oxygen and a basic slag. (E25q, 9-51; CI)

395-E. The Maintenance of Plant and Equipment. J. I. Blackbourn. *British Foundryman*, v. 51, Apr. 1958, p. 204-213.

(E-general; 18-67)

396-E. What to Do About Porosity in Aluminum Castings. John Obrebski. *Iron Age*, v. 181, May 15, 1958, p. 71-74.

(E25q; 9-68, Al)

397-E. Pressure Die Casting of Necchi Sewing Machine Components. *Machinery*, v. 92, Apr. 25, 1958, p. 973-982.

(E13, 1-52)

398-E. Design of Die-Castings. Pt. 7. Means of Attachment for Die-Cast Components. H. K. Barton. *Metal Industry*, v. 92, May 2, 1958, p. 347-349.

(Conclusion.)
(E13, K13; 17-51, 5-61)

399-E. Designing for Aluminum Permanent Mold Castings. Pt. 2. Advantages and Limitations. P. R. Kalischer. *Precision Metal Molding*, v. 16, Apr. 1958, p. 30-32.

(E12, 17-51; Al)

400-E. Die Casting Lubricants, Their Purpose and Use. R. D. Black. *Precision Metal Molding*, v. 16, Apr. 1958, p. 37-39.

(E13; NM-h)

401-E. A Simplified, Low Cost, Vacuum Die Casting System. Charles W. Ohse. *Precision Metal Molding*, v. 16, Apr. 1958, p. 42-45.

(E13, 1-73)

402-E. Cast-In Tubing. Herbert L. Kee. *Product Engineering, Design Edition*, v. 29, May 12, 1958, p. 76-79.

Tube inserts in die castings offer pressure tightness, compactness and light weight. (E13)

403-E. The Effect of Nitrogen and Vacuum Degassing on the Properties of a Cast Aluminum-Silicon-Magnesium Alloy (Type 356). R. K. Owens, H. W. Antes and R. E. Edelman. Frankford Arsenal. *U. S. Office of Technical Services*, PB 131351, May 1957, 25 p. $.75.

(E25s; Al-b)

404-E. Sulphur in Magnesium-Treated Cast Iron. V. R. Balinskii. *Liteinoe Proizvodstvo*, no. 2, Feb. 1954, p. 18-19. (Henry Brutcher, Altadena, Calif., Translation no. 4097.)

Previously abstracted from original. See item 430-E, 1954, (E25, CI)

405-E. Methods of Producing Internal Motion in Centrifugal Castings During Their Solidification. S. E. Rozenfel'd. *Liteinoe Proizvodstvo*, no. 11, Nov. 1957, p. 24-26. (Henry Brutcher, Altadena, Calif., Translation no. 4170.)

(E25q; SS)

406-E. (English.) **Contributions to the Study of the Graphitization Process in Nodular Cast Iron.** K. I. Vashtshenko and L. Sofroni. *Revue de Métallurgie (Bucarest)*, v. 2, 1957, p. 51-82.

The graphitization process in nodular as contrasted with gray cast iron; volume changes that take place in solidifying and cooling 28 ref. (E25n; CI-s)

407-E. (French and German.) **Casting of Nonferrous Plumbing Parts.** R. Schlatter. *Pro-Metal*, no. 61, Feb. 1958, p. 933-946.

(E-general, T6a; Cu-n, Cu-s)

408-E. (German.) **The Use of Metal Chills in Steel Casting.** Hermann Wesner and Wolfgang Probst. *Giessereitechnik,* v. 4, Feb. 1958, p. 30-32.

(E22r; ST)

409-E. (German.) **Contribution to the Problem of Surface Defects in Steel Casting.** Joseph Czikel. *Giessereitechnik,* v. 4, Feb. 1958, p. 32-34.

(E25, 9-71; ST)

410-E.* (German.) **Addition of Oxide-Preventing Elements on Surface of Metal Melts.** Friedrich Erdmann-Jesnitzer, Hansfriedrich Hadamovsky and Rosemarie Görner. *Zeitschrift für Metallkunde,* v. 49, Mar. 1958, p. 133-140.

Distribution of addition agents in basic metals in solid and in liquid state. Mechanism of protective effect of trace elements on surface oxidation. (E25, R1h)

411-E. (Russian.) **Improved Method of Production of Bimetallic Bushings.** L. N. Gorodetskii. *Vestnik Mashinostroeniya,* Mar. 1958, p. 39-40.

Use of centrifugal casting for fusion of bronze and steel.
(E14, T7d; Cu-s, ST)

412-E. (Russian.) **Improvement of Steel Casting Technique.** M. N. Kravetz. *Stal',* Jan. 1958, p. 40-42.
(E11; ST)

413-E. (Spanish.) **Applications of Alloys in Cast Iron Production.** Thorval Andersen. Paper from *Second National Congress of the Steel Industry,* Mar. 1957, p. 143-152.

(E25; CI-q, *Cr, Mn, Si,* AD-n)

414-E. (Spanish.) **Casting Design.** Manuel Lizcano A. Paper from *Second National Congress of the Steel Industry,* Mar. 1957, p. 261-265.

(E-general; 17-51)

415-E. General Principles of Cupola Operation. H. J. Leyshon. *British Cast Iron Research Association, Journal of Research and Development,* v. 7, Apr. 1958, p. 224-248.

Importance of combustion conditions; mechanism of the combustion processes; relationship between the melting rate, coke charge and blast rate; influence of these factors on metal temperature; factors influencing silicon loss or gain, carbon pick-up, sulphur control. 21 ref.
(E10a; CI)

416-E. New Methods for Bath Production at Greenford. *Foundry Trade Journal,* v. 104, May 8, 1958, p. 539-546.

Cast iron bathtub founding and finishing plant.
(E11, 1-52, L27, 18-67; CI)

417-E. Designing Vacuum Plaster Mold Castings. W. G. Wilkins. *Machine Design,* v. 29, Nov. 1958, p. 106-108.

(E16a, 1-73)

418-E.* The Necchi Die Casting Foundry. *Machinery, (London),* v. 92, Feb. 28, 1958, p. 499-507.

Pressure die casting of arm and bed castings and other sewing machine parts. Layout and organization of new foundry; the die castings are 70% Al and the remainder Zn alloys. Output is approximately 50 tons per month.
(E13, T10c; Al, Zn)

419-E. The Production of Shell Molded Crankshafts. J. R. Vinette. *Machinery, (London),* v. 92, May 16, 1958, p. 1159-1161.

(E16c, T21b; ST)

420-E. Process Controls for Making Turbine Castings. Robert Ahles. *Mechanical Engineering,* v. 80, Apr. 1958, p. 61-63.

Advances in production of high-quality steel castings for turbine application. (E11, W11, 9-18; ST)

421-E.* The Parlanti Mold Process for the Casting of Metal by Controlled Rate of Heat Transfer. Conrad A. Parlanti and Rodger D. Veneklasen. *Modern Castings,* v. 33, May 1958, p. 79-85.

Method of controlling the even cooling of a cast mass to obtain optimum physical properties in castings at least comparable to the test bar figures expected from any particular alloy. Applicable to all light alloys, cast irons and steels.
(E19, E25n; CI, ST, EG-a39)

422-E. Experiences in Non-Ferrous Die Casting Die and Permanent Mold Life. G. Otto. *Modern Castings,* v. 33, May 1958, p. 86-88.

Control of die maintenance, lubricants, die materials and mold coatings. (E13, E12, W19n)

423-E. Progress in Vacuum Die Casting. David Morgenstern. *Modern Castings,* v. 33, May 1958, p. 101-104.

(E13, 1-73)

424-E.* Magnesium Content and Graphite Forms in Cast Iron. James F. Ellis and C. K. Donoho. *Modern Castings,* v. 33, May 1958, p. 105-111.

Effect of increasing Mg content in three different base irons on tensile properties and graphite structures. Transition structures in changing from flake to spherulitic graphite. Effect of excessive Mg content on graphite form. An extension of the standard system of graphite classification is suggested.
(E25q; CI-r, *Mg*)

425-E. A Method of Casting Radiator-Type Fuel Elements for a Nuclear Reactor. A. W. Hare and R. F. Dickerson. *Modern Castings,* v. 33, May 1958, p. 112-114.

(E12, T11g; U)

426-E. Some Remarks on the Relationship of Interface Temperature and Solidification. V. Paschkis and J. W. Hlinka. *Modern Castings,* v. 33, May 1958, p. 115-123.

(E25n)

427-E. New Aluminum-Magnesium-Zinc Casting Alloy. H. C. Rutemiller. *Modern Castings,* v. 33, May 1958, p. 124-126.

(5 ref.) (E-general; Al, *Mg, Zn*)

428-E.* Ductile High Strength Titanium Castings by Induction Melting. J. Zotos, P. J. Ahearn and H. M. Green. *Modern Castings,* v. 33, May 1958, p. 127-132.

Tests indicate that scrap Ti can be reprocessed by induction melting and still exhibit desirable engineering characteristics that make it a useful foundry alloy. 22 ref.
(E10, 1-69; Ti, RM-p)

429-E.* Occurrence and Elimination of Leakage in a Gun Metal Casting. Marvin Glassenberg, Alfred H. Hesse and William H. Baer. *Modern Castings,* v. 33, May 1958, p. 133-139.

To overcome porosity of gun metal castings, chills of the same material and a specially designed ring-type gating system are used.
(E22p, E22r; Cu-b, 9-68)

430-E. Foundry Practice for Sand Casting Commercially Pure Aluminum. Robert V. Scalco and Moss V. Davis. *Modern Castings,* v. 33, May 1958, p. 140-142.

(E11; Al-a)

431-E.* (French.) **Aspects of Automation in the Foundry.** Jacques Le Covec. *Fonderie,* v. 146, Mar. 1958, p. 105-112.

Presuppositions of automation: mass production, standardizing of single operations and specialization of workers. Examples of automation in cupola furnace process, sand preparation and molding, trimming and heat treatment. Advantages of automatic processes.
(E11, 18-74)

432-E. (French.) **Aging of Core Sand With Dextrin. Method of Testing Dextrin for Foundry Purpose.** Claude Konlein. *Fonderie,* v. 146, Mar. 1958, p. 113-118.

Behavior in drying and in forming of molding sand compound kept for some time in hermetically closed containers. Examination of molding dextrin by testing its solubility and rotative ability. Best dextrin must have a solubility between 45 and 70% and a rotative ability of 140-150°. (E18r)

433-E.* (French.) **Economical Method of Nodular Cast Iron Production by Treatment of Liquid Melt With Iron-Silicon-Magnesium Alloy.** Nicolas Volianik. *Fonderie,* v. 146, Mar. 1958, p. 119-135.

History of use of Mg in cast iron. Outline of modern processes. Experimental technique using Fe-Si-Mg alloy and specially designed apparatus. Improvement in quality of cast iron. (E25q; CI-r; *Mg*)

434-E. (French.) **Casting With Carbon Dioxide.** *Journal d'Informations Techniques des Industries de la Fonderie,* No. 94, Mar. 1958, p. 5-9.

Evaluation of advantages and disadvantages of the CO_2 method of hardening sand cores with sodium silicate binder. (E18n)

435-E. (German.) **Production of Large Castings for Heavy Machines in the Soviet Union.** P. F. Wassilewski. *Giesserei,* v. 45, Apr. 10, 1958, p. 193-197.

(E-general; ST)

436-E.* (German.) **Unusual Casting Defects.** Walter Goschel. *Giessereitechnik,* v. 4, Feb. 1958, p. 37-40.

Gas bubbles causing blowholes may originate through the use of 55-mm. diameter cores instead of 60-mm. Large parts with thick walls may become defective if the molding sand becomes heated, expands and presses on fixed cores.
(E11, E25, 9-68)

437-E. (German.) **Savings in Materials Using Spheroidal Pressure Riser.** Karl Heinz Meinecke. *Giessereitechnik,* v. 4, Mar. 1958, p. 49-53.

Construction of closed ball-shaped pressure riser possessing chalk-core for increase of pressure and a tangential entrance. Decrease of scrap as compared with usual riser.
(E22q)

438-E.* (German.) **Segregation in Gray Cast Iron Chill Castings.** Wolfgang Gaude. *Giessereitechnik,* v. 4, Mar. 1958, p. 58-59.

Appearance and prevention of droplets (segregation) on castings. Mechanism of this type of segregation. (E22r, 9-69; CI-n)

439-E.* (German.) **Use of Separating Cores in Steel Casting.** Friedrich Dubielzig. *Giessereitechnik,* v. 4, Mar. 1958, p. 62-65.

Use of cores for easy separation of risers. Composition of core mixtures for green sand and dry casting. Forming of cores and molding technique. Applications.
(E19, E21; ST)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

440-E. (Italian.) **Possibilities of Reducing Fabrication Costs in Small Foundries.** Giuseppe Barchiesi. *Fonderia*, v. 7, Jan. 1958, p. 3-9.

(E-general, A4s)

441-E. (Italian.) **Computation of the Surface Area of a Sand.** Rinaldo Cattaneo. *Fonderia*, v. 7, Feb. 1958, p. 91-95.

(E18r)

442-E. Scrap Castings Caused by Hard Spots. H. Reininger. *Foundry Trade Journal*, v. 104, May 15, 1958, p. 573-578.

Undesirable hard spots and edges in castings may be reduced by careful control of C and Si content, using cementite-free pig, removing Cr and V impurities and redesigning mold to eliminate or reinforce fins and air vents.

(E11, 9-71; CI, *Cr, Si, V*)

443-E.* **Casting Ferrous Metals in Anodized Molds.** Lester D. LaMotte. *Precision Metal Molding*, v. 16, Mar. 1958, p. 46-48.

Problems of permanent mold casting minimized by development of the Parlanti mold. It is anodized cast Al, designed to give the most desirable rate of heat transfer so that the mold surfaces are not destroyed by overheating and the casting has the best internal structure. (E12; 17-57, Al)

444-E.* **Designing for Aluminum Permanent Mold Casting. Pt. 1. Alloy Selection.** P. R. Kalischer. *Precision Metal Molding*, v. 16, Mar. 1958, p. 51-53.

Nominal compositions and equivalent specifications; mechanical properties; comparative ratings in castings, application, and service; typical physical properties of Al permanent mold alloys.

(E12, Q-general, P-general, 17-51; Al)

445-E. Basic Hot Blast Cupola in the Integrated Steelworks. Heinz Voigt. *Stahl und Eisen*, v. 78, Mar. 6, 1958, p. 284-291. (Iron and Steel Institute Translation no. 902.)

Previously abstracted from original. See item 306-E, 1958.

(E10a, 1-65, A4s; ST)

446-E. (German.) **Casting Properties of the Stanniferous Cast Copper Alloys.** Wilhelm Patterson. *Giesserei*, v. 45, Apr. 24, 1958, p. 220-228.

17 ref. (E25; Cu-b, *Sn*)

447-E. (German.) **High-Pressure Casting Dies and Equipment for the Production of Centrally Gated Die Castings on Horizontal Chamber Die Casting Machines.** Walter Bovensmann. *Giesserei*, v. 45, Apr. 1958, p. 244-247.

(E13, E22p, 1-52)

448-E.* (German.) **Grain Refinement of Aluminum and Its Alloys.** Elfriede Dittrich. *Neue Hutte*, v. 3, Feb. 1958, p. 93-101.

Movement, casting and superheating temperatures, as well as cooling velocity and small-scale inoculations with Ti, B, Zr, V, Cb, Mo and W, investigated. Both Ti and B seem to be particularly advantageous for grain refining. 19 ref. (E25q; Al)

449-E. (Italian.) **Chill Casting of Light Alloys.** Biagio Caliri. *Revista di Meccanica*, v. 9, Mar. 1, 1958, p. 9-16.

(E22r; Al, Mg, Li)

450-E.* (Portuguese.) **Cast Iron Pistons.** Alberto A. Arantes, Cyro Guimaraes and L. A. Lacerda Santos. *ABM, Boletim da Associacao Brasileira de Metais*, v. 14, Jan. 1958, p. 5-18.

Composition of Brazilian raw materials, pouring techniques, mold design and addition elements analyzed for influence on casting defects, mechanical properties, microstructure of pistons. In spite of high phosphorous content of Brazilian pig, structures compare favorably with those of foreign-made pistons. Low sulphur content of some pig was found to impede formation of lamellar graphite. 8 ref. (E11, T21b, 17-57; CI)

451-E.* (Portuguese.) **Molding Sands Agglomerated With Wet Clays as Compared to Dry Clays.** Victor Lo Re. *ABM, Boletim da Associacao Brasileira de Metais*, v. 14, Jan. 1958, p. 53-62.

Wet clay obtained from source near place where study was conducted (cost therefore being a fraction of that of dry clay) provided greater compression strength and AFS hardness than same clay in powder form or a commercial powdered clay. Tests were made on damp as well as dried samples of mixtures. (E18r)

452-E. (Russian.) **Drying of Cores in a High-Frequency Electrical Field.** Yu. P. Basin. *Liteinoe Proizvodstvo*, v. 2, Feb. 1958, p. 7-10.

Among the advantages of high-frequency drying of casting cores are a decrease in the heat expenditure and very favorable conditions for automation of the process.

(E21h, 1-69)

453-E.* (Russian.) **Linear Changes of Ceramic Molds in Heating and Cooling.** O. V. Stupishina. *Liteinoe Proizvodstvo*, v. 2, Feb. 1958, p. 20-23.

Addition of fireclay powder lowers the linear expansion by 2.5 times and of fused quartz by 6 times. A ceramic based on silicate suspension with waterglass as bond and with fireclay powder prevents sharp linear changes during heat treatment. Expansion and contraction curves obtained with optical dilatometer and precision furnace with maximum heating temperature of 1000° C. (E19)

454-E. (Russian.) **Melting 18 KHNVA Steel in an Arc Furnace.** V. K. Petrov, A. P. Kopeikin and E. D. Mokhir. *Stal'*, v. 18, Apr. 1958, p. 326-330.

(E10r, W18s; ST)

455-E. (Swedish.) **Casting Defects and Their Causes.** J. Drachmann. *Gjuteriet*, v. 48, Apr. 1958, p. 49-55.

4 ref. (E25q, 9-68)

456-E. (Swedish.) **Design of Castings With Regard to the Fettling Operations.** Alrik Ostberg. *Gjuteriet*, v. 48, Apr. 1958, p. 56-59.

(E25q, E22p, E22q, 17-51)

F Primary Mechanical Working

169-F. Mechanical Scarfing. Irwin H. Such. *International Acetylene Association, Official Proceedings*, 1956, p. 116-125.

Method for conditioning surface of steel with oxy-acetylene flames and scarfing oxygen jets before it is rolled into forms for fabrication. (F21e; W20j)

170-F. New Tube-Drawing Ideas Boost Mill Capacity. R. H. Eshelman. *Iron Age*, v. 181, May 15, 1958, p. 75-77.

(F26r; 18-67)

171-F. Aluminum Plate Production. New Ancillary Equipment in Operation at Rogerstone. *Metallurgia*, v. 57, Apr. 1958, p. 175-180.

Northern Aluminium Co. Ltd., Rogerstone, Monmonthshire.

(F23, W23b; Al, 4-53)

172-F. Photo-Elastic Stress Analysis. W. Shelson. *Ontario Hydro Research News*, v. 9, July-Sept. 1957, p. 11-14.

(F2, G25)

173-F. Pellet Extrusions Beef Up Magnesium Structures. G. S. Foerster and H. A. Johnson. *Product Engineering, Design Edition*, v. 29, May 12, 1958, p. 80-81.

Molten Mg is sprayed through an orifice onto a spinning disk in an atmosphere of natural gas. Centrifugal force disperses the metal into small droplets. These solidify and are blown to a screening station where oversize pellets are removed. To extrude the pelletized material, they are blown through pipes into the chamber of an ordinary extrusion press from which they are extruded through a die that gives the desired shape.

(F24, H10f, Q-general; Mg-b)

174-F. New Extrusion—Fabrication Process Reduces Jet Engine Parts Costs. Neil J. Feola. *SAE Journal*, v. 66, Feb. 1958, p. 32-35.

(F24; T24b; Ti-b)

175-F. Induction Heating of Titanium Alloys for Hot Working. V. A. Yakovlev and Ya. I. Spektor. *Metallovedenie i Obrabotka Metallov*, no. 1, Jan. 1958, p. 43-46. (Henry Brutcher, Altadena, Calif., Translation no. 4124.)

(F21b, J2g; Ti)

176-F. Grain Growth and Surface Decarburization in Induction Heating of Steel Billets. Ya. I. Karker and M. G. Kogan. *Metallovedenie i Obrabotka Metallov*, no. 1, Jan. 1958, p. 46-49. (Henry Brutcher, Altadena, Calif., Translation no. 4125.)

(F21b, J2g, N3; CN, AY, 5-59)

177-F. Automation of a 12-Roll Reversing Cold Rolling Mill. Herbert Schamale. *Stahl und Eisen*, v. 76, Dec. 13, 1956, p. 1698-1700. (Iron and Steel Institute Translation no. 641.)

Previously abstracted from original. See item 50-F, 1957.

(F23, 1-67, S14, 18-74; ST)

178-F. How to Determine Forging and Finishing Periods. Hans Haller. *Werstatt und Betrieb*, v. 90, Apr. 1957, p. 227-232. (Iron and Steel Institute Translation no. 874.)

Previously abstracted from original. See item 128-F, 1957.

(F22, 3-67)

180-F. (German.) **Time Studies on Rolling Mill Trains.** Kurt Lehmann. *Stahl und Eisen*, v. 78, Apr. 17, 1958, p. 505-509.

(F23, A5d; 4-52, ST)

181-F. (Russian.) **Rolling in Accordance With Theoretical Weight at the Petrovsk Works.** I. I. Entin and N. I. Beda. *Stal'*, Jan. 1958, p. 55-57.

(F23, W23b)

182-F.* (Russian.) **Determination of Spreading in Rolling.** M. V. Shuralev and S. G. Nekrasov. *Stal'*, Jan. 1958, p. 57-60.

A relatively simple formula permits the determination of spreading which takes place while rolling stock. Certain experimental correction factors are applied for various conditions. 6 ref. (F23)

183-F.* (Russian.) **Production of Hot Rolled Tubes From Steel No. EI595 and Their Properties.** N. S. Al-

ferova, G. P. Pishchikov and V. P. Konovalov. *Stal'*, Jan. 1958, p. 60-66.

This steel shows pronounced tendency to brittleness under cold working. Investigation of the effect of heat treatment on the tendency toward brittleness and rupture showed that heating to 950° C., followed by quick quenching, lowers the critical temperature of transition. Rolling at lower temperature results in fine grain structure and reduced sensitivity to brittleness. 4 ref. (F26s, Q26s; ST)

184-F.* (Russian.) **Weldability of Cracks in Alloy Steels by Rolling.** I. N. Golikov and B. M. Litvinov. *Stal'*, Jan. 1958, p. 66-70.

Longitudinal cracks are easily welded by small amount of deformation of 2-3 extension coefficient. Transverse cracks lengthen as rolling proceeds, their walls touch and finally become welded together. Cracks up to 25 mm. in a square bar of 125-140 mm. become welded while the bar is reduced to 40 x 40 mm. 6 ref. (F23, 9-72; AY)

185-F. (Spanish.) **Steel Industry and Modern Methods in Steel and Tin Plate Production.** Reynaldo Vega. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 189-205.

Steel industry in Mexico; processes and methods in pickling using H_2SO_4; reduction in reversing mills; cleaning, annealing, quenching, cold tinning and cutting of steel sheet. (F23, J-general, L-general; ST, *Sn*, 4-53)

186-F. (Spanish.) **Innocenti Calmes Process of Seamless Pipe Production.** Jorge Gomez Llerenas. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 275-279.

Production of 6-in. line pipe at Tamsa Plant, Mexico. Micrographs of cross sections made during drawing operations. (F26r, M27; ST)

187-F. (Spanish.) **Processes for Fabrication of Seamless Steel Pipe.** Ugo Keller. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 281-287.

(F26; ST)

188-F. (Spanish.) **Seamless Steel Pipe in Latin America.** Francisco Indaco. Paper from *Second National Congress of the Steel Industry*, Mar. 1957, p. 289-295.

(F26; ST)

189-F. Manufacture of Copper Wire. H. D. Feldmann. *Draht, English Edition*, no. 34, Apr. 1958, p. 19-22.

Work hardening and annealing, pickling, washing and welding, reductions and defects. (F28; 4-61, Cu)

190-F. Large Drop Hammer Makes Better Parts. George H. DeGroat. *American Machinist*, v. 102, June 2, 1958, p. 98-99.

(F22n, W22q)

191-F.* Forging Alloys for Gas Turbine Discs and Blades. *Aciers Fins & Speciaux*, no. 28, Mar. 1958, p. 22-25.

Alloys used are always high in Ni and have variable amounts of Cr, Co, Mo, W, Ti and Al. They are austenitic and are generally capable of structural hardening. Cold strength frequently exceeds 100 kg. per sq. mm. (F22, Q27, T7h; SGA-h)

192-F. Designing, Fabricating Pressure Piping. J. J. Murphy, C. R. Soderberg, Jr., H. S. Blumberg and D. B. Rossheim. *Heating Piping and Air Conditioning*, v. 30, Jan. 1958, p. 160-164.

Current pressure equipment practices and analysis of the interrelation of materials, design, fabrication, and inspection with safety, economics, and service. (F26p; 17-51)

193-F. Manufacturing Facilities for Massive Plate. *Light Metals*, v. 21, May 1958, p. 144-147.

(F24, F23, 1-52; Al-b, 4-53)

194-F. Application of Phosphate Coatings to the Multiple Cold Drawing of Tubes. M. S. Goncharevsky. *Stal'*, Mar. 1957, p. 243-253. (Iron and Steel Institute Translation no. 617.)

Previously abstracted from original. See item 152-F, 1957. (F26r, 1-7; NM-h)

195-F. Experiences in the Rolling and Rerolling of Wide Strip in Multiple-Stand Cold Rolling Mills. Vincenz Seul and Joseph Billigmann. *Stahl und Eisen*, v. 76, Feb. 10, 1955, p. 144-162. (Iron and Steel Institute Translation no. 659.)

Previously abstracted from original. See item 71-F, 1955. (F23, 1-67; CN, 4-53)

196-F. Investigations on a 4-High Reversing Mill Stand Rolling Cold Strip for Tinplate. Pt. 1. Measurements to Determine the Power and Work Required and the Degree of Utilization. Pt. 2. Effect of Rolling Force, Rolling Speed, Strip Tension, and Amount of Lubrication Used on the Trueness to Dimensions of Cold Rolled Strip. Karl Heinz Spiller. *Stahl und Eisen*, v. 77, June 27, 1957, p. 867-881. (Iron and Steel Institute Translation no. 660.)

Previously abstracted from original. See item 126-F, 1957. (F23, W23c, 1-52; ST)

197-F.* (German.) **On the Hydrodynamic Theory of the Hot Rolling Process.** Alfred Kneschke. *Archiv für das Eisenhüttenwesen*, v. 28, Jan. 1958, p. 11-21.

Hydrodynamic theory of hot rolling developed mathematically. Functional dependence of mechanical values on the values of the rolling parameters such as surface speed of rolls, thickness of material, reduction rate, radius of roll, yield stress and dynamic ductility of the rolled material is analyzed; practical data on pressure in the rolling gap, the state of movement and deformation resistance were verified mathematically and explained. 24 ref. (F23, 1-66; ST; 10-51)

198-F. (Russian.) **Investigation of Rolling Pressures in Plate Mills.** Z. F. Tsukanov, F. K. Ivanchenko, L. F. Molotkov, B. A. Pavlenko, V. A. Kikolaev, A. L. Krizhanovskii and P. Ya. Kokhno. *Stal'*, v. 18, Apr. 1958, p. 332-334.

Measurement of rolling loads sustained by rollers in medium plate mill makes possible precise calculation of necessary pressure and results in considerable increase in productivity. (F23, W23b, 3-74, 4-53)

Secondary Mechanical Working

Forming and Machining

272-G. Ultrasonic Drill for Boring Small Holes in Hard Materials. N. K. Marshall. *Industrial Diamond Review*, v. 18, Jan. 1958, p. 17-19.

(G24c, W25p)

273-G.* The Control of Earing in Aluminum and Its Alloys. R. T. Thorley and G. E. G. Tucker. *Institute of Metals, Journal*, v. 86, Apr. 1958, p. 353-361.

Earing of sheet produced in the normal manner (i.e., by homogenizing the ingot, hot rolling, cold rolling, and final annealing) has been found to vary according to the finish thickness. The shape of the curve of earing plotted against finish thickness is dependent upon the fabricating conditions and this curve has been used to show the effects of alloy type and composition, preheating, hot rolling, interannealing and cold rolling. 14 ref. (G4; Al)

274-G. Principles and Applications of Spark Machining. D. W. Rudorff. *Institution of Mechanical Engineers, Proceedings*, v. 171, no. 14, 1957, p. 495-511.

15 ref. (G24a)

275-G. Flame-Cutting of Air Hardening Steels. M. M. Griffith. *International Acetylene Association, Official Proceedings*, 1956, p. 97-99.

(G22g; ST)

276-G. Looking Ahead With Chemical Milling. Jay Sullivan. *Machine and Tool Blue Book*, v. 53, May 1958, p. 127-128, 130, 132, 134-136.

Grain orientation and its directional characteristics and the change in the radius of curvature caused by size reduction to be accounted are the most valuable tips to designer. (G24b)

277-G. Rotary Extrusion Reduces Costs and Saves Material. J. Genis and W. Mallindine. *Machinery*, v. 64, Apr. 1958, p. 115-121.

Processes and equipment used for reduction in metal thickness; titanium, steel and others; deformation under pressure up to 50,000 psi. Metal thickness reduced 75% in one pass; different types of rotary extrusion and results obtained. (G5, G11, G13, T24b; Ti, ST)

278-G. Man Made Industrial Diamonds for Grinding Wheels. N. A. Matthews and Norman Leventhal. *Machinery*, v. 64, Apr. 1958, p. 122-127.

Results of tests comparing natural and man-made diamonds; laboratory tests and tables. Applications and limitations. (G18, W25c; NM-k37)

279-G. Carbide Tooling on Automatics. *Machinery*, v. 64, Apr. 1958, p. 128-131.

Use of tungsten carbide tools in outer cups for nickel-alloy steel roller bearing production at Duston, England, plant of British Timken Ltd. Processes and details. (G17b, T7d; AY, W, 6-69)

280-G. Double End Machining of Unwieldly Castings. Robert Kennedy. *Machinery*, v. 84, Apr. 1958, p. 140-141.

(G17; CI-s)

281-G. Economical Small-Lot Machining of Large Parts. *Machinery*, v. 64, Apr. 1958, p. 150-154.

Heavy steel weldments and castings for road building equipment processed on special machines. Floor space savings of up to 80% and reductions in capital equipment costs of 50% are possible with these multiple-purpose machines. Operations and results. (G17, W25; ST, 5-60, 7-51)

282-G.* Forming Titanium Extrusions. I. J. Wilson. Digest of paper given before Titanium Conference, Western Metal Congress, Mar. 1957. *Metal Progress*, v. 73, May 1958, p. 188-189, 192.

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

Titanium extrusions can be successfully formed by observing five points: take proper steps to secure a good surface condition; form at room temperature or above 1250° F.; do not exceed the limited shrink and stretch allowables; use a generous bend radius; use good tooling.
(G-general; Ti, 4-58)

283-G. High-Speed Coining. Robert M. Johnson and James Mourning. *Metalworking Production,* v. 102, Apr. 25, 1958, p. 724-725.

(G3n, Mg)

284-G. Cutting With Ceramics. Charles E. Penaz. *Northwestern Engineer,* v. 17, Feb. 1958, p. 24-26, 60.

New advance in cutting tool technique. Use of ceramic tool bits. Superiority of ceramic tools over carbides. They can cut at much higher speeds, better finishes, longer tool life and coolants are generally unnecessary.
(G17, T6n; SGA-j; 6-70)

285-G.* Use Chemical Milling to Make Light, Close-Tolerance Parts. Charles H. Lundquist. *Precision Metal Molding,* v. 16, Apr. 1958, p. 54-57.

Application of chemical milling techniques to cast Al, Mg, Ti or steel. Tolerances and surface finishes to be expected.
(G24b; Al, Mg, Ti, ST)

286-G. Enamel Glasses as Lubricants for Forming Sheet Metal. A. Hegarty. *Scientific Lubrication,* v. 10, Feb. 1958, p. 12-13, 24.

Use of low-melting glasses in molten conditions as lubricants.
(G4; NM-h, NM-f42)

287-G. New Machine Whips Contouring Job. *Steel,* v. 142, May 12, 1958, p. 90-91.

Machine to mill jet turbine blades automatically uses rectangular bar stock, operates on principles similar to automatic screw machines.
(G17b, T7h)

288-G. Plastics in Plant Tooling. Otokar F. Bernardin. *Tool Engineer,* v. 40, May 1958, p. 85-88.

Plant experience shows that plastic tools, jigs, fixtures and gages give good performance at a considerable saving over comparable metal tools. (G-general, NM-d)

289-G. Determining Tool Life on Nodular Cast Iron. Gerhard Hug. *Tool Engineer,* v. 40, May 1958, p. 97-103.

Comparative tests indicate that increasing nodular graphite improves machinability markedly. Also, larger nose radii, consistent with finish, are desirable. (G17; CI-r)

290-G. The Arcair Torch. T. D. Warren. *Welding and Metal Fabrication,* v. 26, Feb. 1958, p. 67-70.

A metal-cutting process in which an arc is drawn between a carbon electrode and the workpiece.
(G22h, W29d)

291-G. Grinding of Hard Metals With Electrically Conducting Abrasives, Using Graphite as a Filler. I. K. Trushin. *Vestnik Mashinostroeniya,* v. 37, no. 5, 1957, p. 59-61. (Henry Brutcher, Altadena, Calif., Translation no. 4105.)

(G18; 6-69, NM-j)

292-G.* (English.) Machinability of Metals. Hidehiko Takeyama and Eiji Usui. *Journal of Mechanical Laboratory of Japan,* v. 3, no. 2, 1957, p. 81-86.

Machining data for Al, Cu, brass, mild steel, alloy steel and cast iron machined under definite conditions and compared with mechanical properties of the metals. Considers machinability in terms of chip formation which is expressed by shear angle or chip thickness ratio. Slope near the fracture point of the shear deformation and stress curves is closely associated with the behavior of the metallic fracture ahead of the tool face during machining and with the tool chip contact area.
(G17k; Al, Cu, CN, AY, CI)

293-G. (French.) Carbide-Tipped Tools and Special Lathes Speed Up Machining of Forged Crankshaft Pins. *Machine Moderne,* v. 52, Apr. 1958, p. 16-18.

A group of four machines synchronized with a conveyer and an automatic fixture loader reduces machining time through use of carbide-tipped front and rear slide cutting tools. (G17, T7j, 6-69)

294-G. (French.) Machining and Grinding Spheroidal Graphite Cast Iron. *Metallurgie et Construction Mecanique,* v. 90, Apr. 1958, p. 273-283.

(G17, G18; CI-r)

295-G. (French.) Carbide Cutting Tools. Max Lainey Broida. *Metaux Corrosion-Industries,* no. 389, Jan. 1958, p. 30-51.

To be continued.
(G17, T6n; 6-69)

296-G. (German and French.) Cutting Tests on Aluminium Alloys. H. Greutert. *Aluminium Suisse,* v. 8, Mar. 1958, p. 41-47.

Aluminium alloys containing Pb and Bi produce desirable short chips, eliminate lathe stoppage. Importance of cutting angle and right working conditions. ("Aludur" types: Al-Cu-Pb-Bi; Al-Cu-Mg-Pb; Al-Mg-Si-Pb; Al-Cu-Mg-Pb)
(G17k; Al-f, *Pb, Bi, Cu, Mg*)

297-G. (German.) How to Grind Carbide Metal and/or Carbide Tips With Diamond Grinding Wheels. G. Pahlitzch and G. Rafflenbeul. *Werkstatt und Betrieb,* v. 91, May 1958, p. 249-257.

(G18, W25c, 6-69)

298-G. (German.) Combination Cutting and Drawing Die. G. Nowak. *Werkstatt und Betrieb,* v. 91, May 1958, p. 280.

Die for drawing a plate-shaped workpiece and for simultaneous cutting and bending of two clamps.
(G4, W24n)

299-G. (Russian.) Thin-Walled Inserts of Bi-Metallic Steel-Aluminum Alloy Strip. L. Yu. Pruzhanskii. *Vestnik Mashinostroeniya,* Mar. 1958, p. 36-37.

(G17, T7d; Al, ST)

300-G. (Russian.) Production of Bearing Inserts With Layer of Babbitt Sheet Secured by Pressing. V. A. Kel'dyushev. *Vestnik Mashinostroeniya,* Mar. 1958, p. 38-39.

(G17, T7d; Sn)

301-G. "Explorer" Nose Cold Formed From 430 Stainless. *Iron Age,* v. 181, Mar. 6, 1958, p. 113-115.

Special cold forming process literally flows a metal blank into shape. (G11; SS)

302-G. Steel-Tube Stampings: Short Cut to Complex Shapes. J. F. Hullman. *Iron Age,* v. 181, Mar. 6, 1958, p. 122-125.

(G1, G3, CN, 4-60)

303-G. Roll Forming Gets an Assist. *Steel,* v. 142, June 2, 1958, p. 70-71.

Squeezing just prior to roll forming turbine blade. (G11, T7h; SS)

304-G. Machinability Can Be Related to Composition. F. W. Boulger and H. J. Grover. *Tool Engineer,* v. 40, Mar. 1958, p. 114-115.

(G17k, 2-60; ST)

305-G.* Behavior of Metals Under High-Energy Loads. Thomas A. Dickinson. *Tool Engineer,* v. 40, Mar. 1958, p. 119-122.

"Explosive forming" in which metals are subjected to high-velocity impacts has made it possible to shape parts from some difficult-to-form materials in one operation without fracture.
(G-general, NM-k34)

306-G. Spraying of Coolants Increases Tool Life. Alex Wilcox. *Tool Engineer,* v. 40, Apr. 1958, p. 111-112.

(G17, NM-h)

307-G.* Finishing Surfaces by Vibration. Richard C. Hitchcock and John P. Moran. *Tool Engineer,* v. 40, Apr. 1958, p. 127-130.

Production-type vibratory lapping machines generate surface finishes as smooth as three micro-in. Flatness is held to within three helium light bands. Productivity is high compared to manual lapping. Lapping of bronze and stainless steel rings for mechanical shaft seals, using this new and relatively inexpensive equipment.
(G19p, 1-52; Cu-s, SS)

308-G. (Czech.) Vlach's Flame Method for Straightening Welded Constructions. Jaroslav Novacek. *Zvaranie,* v. 7, Apr. 1958, p. 112-116.

(G23p, K9q; 7-51)

309-G.* (German.) Die Stamping and Drop Forging. W. Engelhardt. *Neue Hütte,* v. 3, Mar. 1958, p. 165-173.

Review of die stamping industry in various countries. Types of articles that can be stamped. Fundamental processes in stamping and forging. Manufacture of dies—cold stamping, jet lapping, chromium plating. Suitable lubricants. Prevention of scaling. 19 ref.
(G3, F22n, W24n)

310-G.* Hot Sizing. Hottest Way Yet to Precision-Form Titanium? George De Groat. *American Machinist,* v. 102, June 2, 1958, p. 86-88.

"Hot-sizing", a new technique for forming Ti sheet, reduces costs, rejects, increases production 13 times.
(G-general; Ti)

311-G.* Pinch and Roll Dies Halve Blade Cost. Anderson Ashburn. *American Machinist,* v. 102, June 2, 1958, p. 89-91.

Combined forming and rolling in a single press produces compressor blades at reduced cost, higher accuracy. Heated part is pinched between shaped rollers, which then revolve to roll blade to shape.
(G11, 1-52)

312-G. The Story of Shot Peening. George Leghorn. *American Society of Naval Engineers Inc., Journal,* v. 69, Nov. 1957, p. 653-666.

(G23n)

313-G. Automatic Line Makes Seamless Aluminum Cans. *Canadian Machinery and Manufacturing News,* v. 68, Nov. 1957, p. 112-113.

One blow from an impact extrusion press sends an Al slug through a five-stage process resulting in complete can. (G5, T10g; Al-b)

314-G. New Broaching Tool Cuts Helical Gears in One Pass. R. H. Eshelman. *Iron Age,* v. 181, June 5, 1958, p. 117-119.

(G17d, T7a)

315-G.* Electromagnetic Test Measures Effects of Shot Peening. P. M. Unterweiser. *Iron Age,* v. 181, June 5, 1958, p. 121-123.

Technique based on changes in

electrical and magnetic properties that result from the plastic deformation found in the compressed layer. It can be applied to magnetic materials only. (G23n, 1-54)

316-G. Drilling Research. *Mass Production,* v. 33, Nov. 1957, p. 100-104. (G17e)

317-G. Machine Application of Dry-Drawing Compounds. W. D. Anthony. *Metal Products Manufacturing,* v. 14, Dec. 1957, p. 55-58.

Less cleaning of dies and press areas necessary; machine application more economical than hand application; sheets easier to handle and can be stored for relatively long periods of time between coating and use. (G4; NM-h)

318-G. Electrolytic Grinding Finishes Hard Faces. *Metalworking,* v. 14, June 1958, p. 6. (G18k, G24d)

319-G. Precision Grinding Sintered Gears Successfully! *Precision Metal Molding,* v. 16, Mar. 1958, p. 50. (G18, T7a; Fe, 6-72)

320-G. (Italian.) **Notes on Spark Machining.** Riccardo Mazzanti. *Macchine,* v. 13, Mar. 1958, p. 197-201. (G24a)

H Powder Metallurgy

76-H.* Gas Desorption of Copper Powders. J. C. Tobin and M. J. Sinnott. *AIME Transactions,* v. 212, Apr. 1958, p. 167-171.

Technique for collecting and analyzing the small quantities of gases desorbed on heating metal powders. Gases collected from Cu powders of various types of manufacture contain H_2O, CO_2, and SO_2. Source of the gas traced to surface films on the powder. 8 ref. (H11q; Cu)

77-H. Use of Nickel-Silver Powder Increasing in Low-Cost, High-Production Powder Metallurgy Industry. *Inco,* v. 27, Apr. 1958, p. 21-23.

Pressed metal parts offer cost savings, high production rates, accuracy and varied applications. (H-general, 17-57; Ag, Ni)

78-H.* Porous and Infiltrated Metal. J. E. Elliott. *Metal Industry,* v. 92, Apr. 25, 1958, p. 334-336.

Porous iron infiltrated with molten Cu increases tensile strength and elongation substantially. Sintered bronze filters, composed of spherical powder particles can be made with a wide range of filtering performance. (H16e; Fe, Cu)

79-H.* Atomized Powder Alloys of Aluminum. R. J. Towner. *Metal Progress,* v. 73, May 1958, p. 70-76, 176.

When molten Al alloys, for example 8% iron, are atomized, the fine powder can be compacted and extruded into metal parts with superior strength and structure stability at 400 to 800° F. (H10f, Q-general, 2-62; Al)

80-H.* Fiber Metallurgy. R. H. Reed, W. Pollack and S. W. McGee. *Precision Metal Molding,* v. 16, Apr. 1958, p. 25-26, 53, 58.

Fiber sources, metal fiber felting, pressing, sintering, rolling, press forming, machining and impregnating processes in production of fiber metal parts. Applications of fiber metal. (H17)

81-H. 7th Annual Powder Metallurgy Directory. Advances in Powder Metallurgy. *Precision Metal Molding,* v. 16, Apr. 1958, p. 67-68, 91.

Suppliers of equipment and materials for the industry comment on developments in powder metallurgy. (H-general)

82-H. (English.) **A Study of CrB Cermet.** Riitsu Takagi, Kiyoshi Tamura and Yoshio Tamura. *Journal of Mechanical Laboratory of Japan,* v. 3, 1957, p. 96-98. (From *Journal of Mechanical Laboratory,* v. 11, p. 140.)

Experimental vacuum, hot pressing of chromium-boron powder with or without 10% Ni. Chromium boron pressed at 700° C. obtained densities of 99.5% of theoretical value. Oxidation resistance and thermal shock resistance of cermet. (H14h, 1-73; Cr, B, 6-70)

83-H. (Rumanian.) **Utilization of Scrap From Rolling Process for the Construction of Machine Parts by Powder Metallurgy.** A. Domsa and G. Müller. *Studii si Cercetari de Metalurgie,* v. 2, no. 1-2, 1957, p. 79-86.

(H-general; RM-p)

84-H. (Rumanian.) **Employment of Lubricants in the Pressing of Metal Powders.** A. Domsa, V. Moldovan and V. Nicolae. *Studii si Cercetari de Metalurgie,* v. 2, no. 1-2, 1957, p. 87-98.

5 ref. (H14; NM-h)

85-H. (Rumanian.) **Electrolytic Method of Obtaining Metal Powders.** L. Atanasiu and A. Calusaru. *Studii si Cercetari de Metalurgie,* v. 2, no. 3, 1957, p. 337-350.

An experimental study of the transition from the compact to the powder form in the electrolytic deposition of Cu, Au and Cd as a function of the electrode potential. Micrographic studies of these powders. 10 ref. (H10b; Cd, Cu, Au)

86-H. (Japanese.) **Soviet Powder Metallurgy.** Y. Hara. *Metals,* v. 28, Apr. 1958, p. 265-269.

15 ref. (H-general)

87-H. (Rumanian.) **Application of High-Frequency Induction to the Sintering of Metal Powders, Especially Refractory Powders.** A. Domsa, G. Muller, T. Bereczki and S. Kovacs. *Studii si Cercetari de Metalurgie,* v. 2, no. 1-2, 1957, p. 113-120.

5 ref. (H15n, W28s)

88-H. Complex Powder Metal Parts Call for Higher Density. S. Bradbury. *Iron Age,* v. 181, June 5, 1958, p. 124-125.

(H14g, H11k)

89-H.* Sintered Metal and Cermet Friction Materials. *Metallurgia,* v. 57, May 1958, p. 247-250.

Sintered metal linings are produced by the compression and partial fusion of very fine particles, mainly of powdered metals. Their physical properties, derived from their constituent metals, give them, under certain conditions of high unit loading, longer life and more stable friction than asbestos-based materials. (H14, H15, Q9p)

90-H.* (German.) **Synthetic Solid Bodies. Pt. 2. Influence of Surface Layers Such as Oxide Films on Sintering of Metals.** Martin Clasing. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 69-75.

Tensile strength, fracture, strain, hardness and density of sintered Cu powders were observed under varying conditions as to degree of preoxidation, grain size, sintering temperatures and sintering time under vacuum. Strength of the sintered material was improved through thin oxide films. The oxygen of the film is dissolved in the early stage of the process thus leaving a highly active surface structure which in turn enhances the welding action among particles. 8 ref. (H15, Q-general; Cu, 6-72)

J Heat Treatment

163-J. Precipitation and Magnetic Annealing in a Cu-Co Alloy. J. J. Becker. *AIME Transactions,* v. 212, Feb. 1958, p. 138-144.

Changes in magnetic properties with particle size are used to study the precipitation process in a Cu-Co alloy. In particular, the effect of a field during aging in producing anisotropy is shown to occur entirely during the growth of the particles, after precipitation is complete. 15 ref. (J23, N7, P16; Cu, Co)

164-J.* Tool Steel Development. A. P. T. Taylor-Gill. *Birmingham Metallurgical Society, Journal,* v. 38, Mar. 1958, p. 3-26.

Desirable microstructure for toolsteels with regard to service requirements including wear resistance, shock loading and hardness; times and temperatures of preheat, austenitizing, interrupted quench, isothermal exposure, cooling and tempering treatments for achieving desired microstructures and dimensional stability in high speed hot work and cold work toolsteels. 9 ref. (J26, J29, M27, Q-general, TS)

165-J. Recent Developments in the Field of Malleable Cast Iron. K. Roesch. *Foundry Trade Journal,* v. 104, Apr. 24, 1958, p. 479-483.

(J-general, Q-general, P-general; CI-s)

166-J. Flame-Hardening in Germany. Hans Beike and Erich Zorn. *International Acetylene Association, Official Proceedings,* 1956, p. 84-96. (J2h)

167-J.* High-Temperature Carburizing Takes Half the Time. P. M. Unterweiser. *Iron Age,* v. 18, May 22, 1958, p. 123-125.

Standard low-alloy steels such as 4620, 8620 and 9310 can be advantageously carburized at temperatures above the conventional carburizing temperature range (1700-1725° F.). A case depth normally achieved in 12 hr. can be attained in 6 hr. when carburizing temperature is increased to only 1800° F. (J28g, 2-62, AY)

168-J. Automatic Marquenching Solves Distortion Problem. *Machinery,* v. 64, Apr. 1958, p. 136-139. (J26p; 9-74, ST)

169-J.* A Study of Temperature Uniformity in Heat Treating. Harold N. Ipsen. *Metal Progress,* v. 73, May 1958, p. 89-92.

Tests were made with and without forced convection to study variations in temperature reached by parts in center and edge of a work basket of steel stampings. Nonuniform heating can result in appreciable difference in the structure and properties of heat treated parts. (J28, P11k, W27n; ST)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

170-J. Sub-Zero Quenching and Cold Cycling. *Scientific Lubrication,* v. 10, Feb. 1958, p. 24-26.

New quenching method, applied to Al, steel, Ti and phenolic materials, improves finishes and prevents many breakages during forming operation. (J26q; 2-63)

171-J. Heating Technique Minimizes Distortion. R. E. Wright and C. Schulenberg. *Steel,* v. 142, May 26, 1958, p. 102-103.

Process for hardening large gas turbine parts of Chromolloy steel includes heating in an atmosphere furnace, quenching in liquid carbon dioxide and proper fixturing. (J26; AY, *Cr, Mo, V*)

172-J. Vacuum Processing Improves Material and Product Quality. Robert F. Gunow. *Tool Engineer,* v. 40, May 1958, p. 112-114.

Requirements of vacuum heat treating and brazing furnaces are heating source, a sealed chamber and a pumping system. "Hard to braze alloys" respond favorably to vacuum processing. Cu, Ag, Ni and Au-base alloys are used extensively. (J-general, W27, 1-73, K8j; Cu, Ag, Ni, Au)

173-J. Principles and Application of Heat Treatment for Titanium Alloys. A. J. Griest and P. D. Frost. Battelle Memorial Institute. *U. S. Office of Technical Services,* PB 121636, Dec. 1957, 132 p. $3.50.

(J-general; Ti)

174-J. Age-Hardening Characteristics of a Cast Alloy of Copper-6 Percent Titanium. N. Hehner, H. McCurdy and R. Edelman. Frankford Arsenal. *U. S. Office of Technical Services,* PB 131297, July 1956, 16 p. $.50.

Possibility of using Ti scrap as a hardener for metal alloys. (J27d, Q-general; Cu, *Ti*)

175-J. Investigation of Beta Phase "Recrystallization" in Ti-3% Al-5% Cr Alloy. K. B. Lloyd and E. J. Chapin. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131338, Nov. 1957, 22 p. $.75.

Possibility of controlling the beta grain size during heat treatment of binary and ternary Ti alloys with Al and Cr; effects on mechanical properties. (J27, N3, Q-general; Ti-b)

176-J. Improved Equipment, Material Standards, Inspection Needed for Metal Treating. Ben Berlien. *Western Metalworking,* v. 16, Apr. 1958, p. 60-61.

(J-general, S22, 1-52)

177-J. Effect of Transformation of Ledeburite Upon the Stability of Ferrosilicon. I. N. Strukov and P. V. Gel'd. *Fizika Metallov I Metallovedenie,* v. 3, 1956, p. 564-565. (Henry Brutcher, Altadena, Calif., Translation no. 4154.)

Note on beneficial influence of an anneal at about 750° C. of ferrosilicons containing a ledeburite phase, on the one hand, and such impurities as Al, P, and Ca, on the other, upon various properties, particularly the thermo e.m.f., susceptibility to disintegration in humid atmospheres. (J23, N6, 9-51; AD-n, Fe, Si)

178-J. Effect of Ultrasound on Various Changes in Steel at High Temperatures. S. Tanaka, T. Yoshida and K. Takagi. *Tetsu to Hagane,* v. 37, no. 10, 1951, p. 25-30. (Henry Brutcher, Altadena, Calif., Translation no. 4158.)

Effect of ultrasound upon changes in structure of steel being heat treated. (J-general, Q21f, 1-74; ST)

179-J. Chromized Steel of Higher Corrosion Resistance. N. F. Vyaznikov and A. N. Popandopulo. *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1958, p. 61-62. (Henry Brutcher, Altadena, Calif., Translation no. 4169.)

Improvement of corrosion resistance and surface hardness of chromized steel by additional carburizing. (J28g, L15, R-general; ST, 8-65)

180-J. (French.) **Flame Hardening and Local Heat Treatment.** H. W. Gronegress. *Revue de Metallurgie,* v. 55, Mar. 1958, p. 211-217.

Jominy hardenability test makes it possible to predict the surface hardness and depth of hardening given by flame hardening of carbon and low-alloy steels. Long-time heating tests can be replaced by rapid tests using rotating burners. Surface hardness of high-alloy steels can be estimated, but not the hardening depth. (J2h, J5; CN, AY)

181-J. (German.) **Annealing of Iron and Other Metals in Controlled Atmosphere Containers.** Werner Herdieckerhoff. *Draht,* v. 9, Apr. 1958, p. 141-143.

Use of high vacuum. (J23, 1-73)

182-J.* (German.) **Longer Tool Life Through Selective Electric-Spark Hardening.** E. Hanke. *Fertigungstechnik,* v. 8, Feb. 1958, p. 53-59.

Hardening occurs through electric discharges applied repeatedly to the bearing areas of the surface. Equipment used. Abrasion resistance of the treated surface increased by 100-450%. Micro-examination of tested surfaces showed that high surface hardness is due to the structural changes occurring during electric heating above the transformation range and then cooling, which causes a carbide particle precipitation in the treated metal and refutes the theory that surface hardening is caused by a hard metal layer deposited on the surface during treatment. 10 ref. (J28n; TS)

183-J. (Rumanian.) **Effect of Silicon on the Heat Treatment of Nodular Cast Iron.** L. Sofroni. *Studii si Cercetari de Metalurgie,* v. 2, no. 1-2, 1957, p. 23-36.

8 ref. (J-general, 2-60; CI-r, Si)

184-J.* Alter Tool Structure for Longer Life. Herbert Chase. *Iron Age,* v. 181, Mar. 6, 1958, p. 117-119.

A new type of treatment called "Vitalizing" produces 100% martensite throughout the whole section of the tool, effecting a high degree of transformation. After treatment the tool makes from 75 to 400% more cuts per grind and can be reground until completely used up. Vitalizing is an electronic process employing a chemical bath. (J-general, N8, CN, TS-m, SS)

185-J. Differential Annealing Makes Aluminum Fish Boxes Stronger; Often Cheaper. *Modern Metals,* v. 14, May 1958, p. 44, 46.

New method anneals only the rim of deep drawn blanks, resulting in deeper draws, more uniform strength distribution. (J23, T29p, G4b, 17-57; Al-b)

186-J. Whys and Hows of Stress Relieving. Gerald Scott. *Welding Engineer,* v. 43, Apr. 1958, p. 47-50. (J1a, K9p, K9q)

187-J. High-Frequency Heating Rate and Quenching Temperature for Pearlitic Gray Cast Iron. P. I. Rusin. *Metallovedenie i Obrabotka Metallov,* Mar. 1958, p. 53-56. (Henry Brutcher Altadena, Calif., Translation no. 4178.)

Study of thermal field in cast iron during hardening. Effect of temperature and heating speed on depth of the hardened and transition layers. Most suitable temperature is 980-1050°. (J26, J2g; CI-n, 2-61)

188-J. High-Power Quenching Media. L. V. Petrash. *Metallovedenie i Obrabotka Metallov,* Mar. 1958, p. 56-61. (Henry Brutcher, Altadena, Calif., Translation no. 4179.)

Sources of error in determining cooling characteristics. Three stages of cooling. Maximum cooling speed lies at 140-250°. Effect of circulating and quiescent, hot and cold water. (J26)

189-J. (Russian.) **Abnormal Softening of Lead-Tin Alloys at Room Temperature.** L. N. Larikob. *Doklady Bolgarskoi Akademii Nauk,* v. 10, Jan-Feb. 1958, p. 65-68.

Use of natural aging process. (J27d; Pb, Sn)

190-J.* How Hardening Media Function. *Aciers Fins & Speciaux,* no. 28, Mar. 1958, p. 88-93.

Principal factors relative to the hardening medium are: operating temperature; specific heat; thermal conductivity; viscosity; density; latent heat of vaporization. Factors relative to the hardening piece described. (J26, W28p; ST)

191-J.* New Facts on the Nitriding of 4140 and 4340. A. J. Schwarzkopf. *Iron Age,* v. 181, May 29, 1958, p. 90-93.

Both steels can be hardened to about Rockwell 80 to 90. Case hardness is dependent upon initial core hardness. (J28k; ST)

192-J. (Dutch.) **Annealing of Toolsteel.** J. J. van Herwijnen. *Metalen,* v. 13, Apr. 15, 1958, p. 124-128.

10 ref. (J23n, J23q; TS)

193-J. (French.) **Elimination of Cavities in Very Pure Aluminum.** M. Wintenberger. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 71-75.

(J23; Al-a)

194-J.* (French.) **Influence of Quenching Conditions on Pre-Precipitation in Al-Zn Alloy Containing 10% Zn.** René Graf. *Comptes Rendus,* v. 246, Mar. 10, 1958, p. 1544-1547.

When this alloy is quenched from different temperatures, speed of hardening is greatest around 460° C. This corresponds to a maximum size of zones of pre-precipitation. Existence of dislocations retained by quenching provides interpretation of results of this study. 9 ref. (J26n, N7; Al-b, *Zn*)

195-J. The Effect of Final Annealing in a High Vacuum on the Magnetic Reversal Losses of Hot and Cold Rolled Transformer Plate. Franz Lihl. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 223-226. (Iron and Steel Institute Translation no. 570.)

Previously abstracted from original. See item 233-J, 1957. (J23, 1-73, P16; Fe, 4-53)

196-J. Effect of Surface Hardening by Heating With Mains Frequency Current on the Properties of the Working Rolls for Cold Rolling. V. N. Novikov. *Metallovedenie i Obrabotka Metallov,* June 1956, p. 36-47. (Iron

and Steel Institute Translation no. 780.)

Previously abstracted from original. See item 240-J, 1956. (J2g, M27, W23k, CI)

197-J. Relief of Stresses in Quenched Carbon Toolsteel. A. A. Gol'denberg. *Metallovedenie i Obrabotka Metallov,* Feb. 1958, p. 6-11. (Henry Brutcher, Altadena, Calif., Translation no. 4146.)

9 ref. (J1a; TS)

198-J. Induction Heating of Heavy Section Parts. V. V. Aleksandrov. *Metallovedenie i Obrabotka Metallov,* Feb. 1958, p. 23-28. (Henry Brutcher, Altadena, Calif., Translation no. 4149.)

As applied to large tubes and plates. (J2g; 4-53, 4-60)

K Assembling and Joining

279-K. Ferritic-Austenitic Weld Joints in Thermal Power Stations. F. Zimmer. *Engineers Digest,* v. 19, Mar. 1958, p. 99-102. (From *Revue de Mecanique Appliquee,* v. 3, no. 4, Oct. 1957, p. 162-174.)

(K9n; ST)

280-K. High-Strength Steel Weldments. B. R. Alsobrook. *Machine Design,* v. 30, Feb. 20, 1958, p. 181-184.

(K1, T24a, 7-51; ST)

281-K.* A Look at High Frequency Resistance Welding. Wallace C. Rudd. *Metal Progress,* v. 73, May 1958, p. 82-86.

In addition to welding the old stand-bys, steel, Al and Cu, it is claimed that the high-frequency process will join dissimilar metals, reactive metals and thin-walled stock better and faster than ever. The welding current penetrates scale and oxide layers. (K3)

282-K. Bonding Magnesium Sheet. R. J. E. Hunter. Digest of paper given before Committee on Bonded Structures, Society of Aircraft Materials and Process Engineers, Jan. 1957. *Metal Progress,* v. 73, May 1958, p. 130, 134, 136-138.

Magnesium sheet alloy-ZE 41 containing 4% Zn and 1% Ce, in condition H 24 and in thicknesses from 0.032 to 0.080 in., is being bonded to doublers, boundary angles and stiffeners. (K12; Mg, 4-53)

283-K. Welded Stainless Steel Hollow Core. Michael Watter. *Missiles and Rockets,* v. 3, Mar. 1958, p. 104-105, 107-108, 110.

(K3, T24e, 17-57; SS)

284-K. Dip Brazing Aluminum. James W. Matson. *Pacific Factory,* v. 89, Mar. 1958, p. 36-39, 56.

(K8n; Al-b)

285-K. Welding Copper-Base Alloy Tubes. J. F. Sebald and L. H. Hawthorne. *Power,* v. 102, Mar. 1958, p. 94-97, 196, 198, 200.

Experiments to eliminate joint leaks, weld distortion and to improve resistance to cyclic stress. (K1d; 4-60, Cu-b)

286-K. Welding Copper-Base Alloy Tubes. J. F. Sebald and L. H. Hawthorne. *Power,* v. 102, Apr. 1958, p. 92-95, 194, 196, 198, 202-204.

Distortion and mechanical strength of joints made by welding Cu-base alloy tubes; effect of weld sequence on distortion; strength of welded tube-to-tube sheet joints. (K1d; Cu-b, 4-60)

287-K. Brazing Alloys Tackle Heat Barrier. *Steel,* v. 142, May 19, 1958, p. 140-142.

(K8, SGA-h)

288-K. How to Weld Copper and Its Alloys. Pt. 5. Lester F. Spencer. *Steel,* v. 142, May 26, 1958, p. 122-123.

(K-general, K8, Cu)

289-K. Attaching Carbide Tips to Steel Bodies. Frank E. Montie. *Tooling and Production,* v. 24, Apr. 1958, p. 83-86.

(K-general; 6-69, ST)

290-K. Welding Applications at Derby C & W Works. Pt. 1. A. E. Bates. *Welder,* v. 27, Jan-Mar. 1958, p. 2-10.

Welding steel frames and other railroad car components. (To be continued.) (K-general, T23p)

291-K. Flux-Free Brazing in Reducing Atmospheres. N. H. Jones. *Welding and Metal Fabrication,* v. 26, Feb. 1958, p. 46-52.

(K8; ST)

292-K. The Selection and Welding of Thick Plate for Nuclear Power Applications. A. S. Ailes and W. I. Pumphrey. *Welding and Metal Fabrication,* v. 26, p. 62-66.

(K-general, W11p; ST, 4-53)

293-K. Weld Pointers for High Temperature Materials. L. F. Yntema. *Western Metalworking,* v. 16, Apr. 1958, p. 43.

Procedure and precautions for welding Cb, Ta and Mo.

(K-general; Cb, Mo, Ta, SGA-h)

294-K. Ductile Brazing Alloys Required for Reactors. Peter Patriarca. *Western Metalworking,* v. 16, Apr. 1958, p. 44.

(K8, T11; Ni-b, SGA-f)

295-K. Trio of New MIG Welding Techniques Reduce Dross, Porosity at Low Cost. M. B. Kasen and A. R. Pfluger. *Western Metalworking,* v. 16, Apr. 1958, p. 46-47.

Metal inert-gas welding process utilizes chlorine gas mixture in addition to argon for helium shielding to produce low-porosity, dross-free Al welds. Econoweld process uses inner stream of inert gas and outer stream of nitrogen for shielding. (K1d; Al-b)

296-K. Special Welding Techniques for Petrochemical Vessels. Darwin Christofferson. *Western Metalworking,* v. 16, Apr. 1958, p. 48.

(K-general, T22g)

297-K. Dry Hydrogen Brazing for Complex Stainless Assemblies. Harry Lewis. *Western Metalworking,* v. 16, Apr. 1958, p. 52.

(K8j; SS)

298-K. Thermal Expansion as a Basis for Control of Spot Welding of Duralumin. Yu. A. Pachentsev. *Avtomaticheskaya Svarka,* v. 9, no. 3, 1956, p. 65-71. (Henry Brutcher, Altadena, Calif., Translation no. 3978.)

Previously abstracted from original. See item 477-K, 1957. (K3, P11; Al)

299-K. Arc Welding With Various Shielding Gases. A. V. Petrov. *Svarochnoe Proizvodstvo,* no. 8, Aug. 1957, p. 6-10. (Henry Brutcher, Altadena, Calif., Translation no. 4115.)

Advantages of adding certain quantities of carbon dioxide, oxygen, nitrogen or hydrogen to argon, for argon arc welding, or of using carbon dioxide alone. (K1d)

300-K. (French.) Factor Control in Inert-Gas-Shielded Tungsten-Arc Welding. E. B. La Velle. *Revue de la Soudure,* v. 14, no. 1, 1958, p. 1-16.

Detailed analysis of the large number of interrelated factors, including electrical, atmospheric, electrode and workpiece factors, that may be statistically controlled or adjusted for best economic utilization of the process. (K1d)

301-K.* (French.) Welding Cracks in the Transformation Zone of Alloy Steels Hardened in Air. H. Sekiguchi and T. Kobahashi. *Revue de la Soudure,* v. 14, no. 1, 1958, p. 51-58.

The time interval between welding and the appearance of cracks was determined with the aid of a method whereby the cracking process was checked by postheating treatment. Three types of heat treatment, preheating, complementary heating, and postheating were found suitable for crack prevention. Hydrogen does not play an important part in all types of cracks. 7 ref. (K9, AY)

302-K. (Japanese.) Intert-Gas-Shielded Tungsten Arc Welding of 90-10 Copper-Nickel Alloy. Keiichi Mizuno. *Sumitomo Metals,* v. 9, Oct. 1957, p. 231-244.

10 ref. (K1d; Cu, *Ni*)

303-K. (Spanish.) Plan for a Series of Tests of Strength of Horizontal Position Welds. R. J. Schor and Th. A. C. Van Tongeren. *Ciencia y Tecnica de la Soldadura,* v. 8, Jan-Feb. 1958, 13 p.

8 ref. (K9r, T27a)

304-K. Research Probes Adhesion. *Chemical and Engineering News,* v. 36, June 2, 1958, p. 93.

Molecular models shed light on adhesion, offer way to pick out best adhesive for a given job. (K12)

305-K. How to Weld Copper and Its Alloys. Pt. 3. Lester F. Spencer. *Steel,* v. 142, Mar. 17, 1958, p. 110-116.

(K1h, K2h; Cu-b)

306-K. Paste Solders Automate Assembly. *Steel,* v. 142, June 2, 1958, p. 68-69.

Furnace soldering and brazing with metered paste. (K7g, K8j, 18-74)

307-K.* Automatic Machines Expedite Arc Welding. D. L. Hansen. *Tooling and Production,* v. 23, Mar. 1958, p. 61-64.

Typical of large assemblies involving much arc welding are the blades required on bulldozers and on graders. One such blade includes a heavy curved plate and welded to this are stiffening and supporting members involving several long automatic welds. (K1e, 1-52, K13p, T3n)

308-K. A Wine Tanker With a "Stainless" Reputation for Quality. Philip Ferry. *Welding Engineer,* v. 43, Apr. 1958, p. 38-39.

Welding the world's first tanker designed principally for wine transportation. (K1e, T22j; SS, SGA-g)

309-K. (Czech.) Evaluation of Fluxes for Automatic Welding as Regards Their Suitability for Molten Slag Welding. Julius Zeke. *Zvaranie,* v. 7, Apr. 1958, p. 97-102.

(K1e, 18-74; RM-q)

310-K. (Czech.) Oxidation of Metal in Arc Welding. A. A. Jerochin. *Zvaranie,* v. 7, Apr. 1958, p. 109-112.

Metallurgical conditions causing some metals to oxidize in welding. For the given materials oxidation is found to progress more intensely

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

when welded with a limestone-coated electrode than in an atmosphere of CO_2. 10 ref.
(K1a, K1d, R1h)

311-K. (Dutch.) **Welding of Stainless Steel.** B. Mulder. *Lastechniek,* v. 24, Apr. 1958, p. 51-57.

Scratches, slight damages, small dents or nicks, etc., permissible in ordinary steel plates, cannot be tolerated in high-luster stainless steels. This raises some practical problems on the grinding and polishing of the welded joints of stainless steel plates. (K-general; L10b, SS)

312-K. (French.) **Welding Metallurgy, on the Basis of the Papers Presented at the Public Session of the International Institute of Welding, Essen, July 1, 1957.** H. Granjon. *Soudage et Techniques Connexes,* v. 12, Mar-Apr. 1958, p. 85-100.

Analysis of 26 papers grouped under the following items: development and properties of the molten zone (welding atmosphere, dissolution of gases, effect of hydrogen); behavior of the base metal (ferritic, martensitic and austenitic steels, nonferrous metals such as Ti, Mg, Ni and Al); metallurgy of the bonding zone. 26 ref. (K-general)

313-K.* (German.) **Load-Carrying Capacity of Silver Brazed Joints in Thin-Walled Steel Tubes.** Helmut Koch and Karl-Ludwig Poth. *Schweissen und Schneiden,* v. 10, Apr. 1958, p. 114-119.

Experiments with Ag brazing of various joints on steel tubes. Technique and results. High tensile and shear strength reached.
(K8; ST, 4-60)

314-K.* (German.) **Influence of Current Strength on Arc Welded Butt Joints From the Economic and Qualitative Point of View.** C. Stieler. *Schweissen und Schneiden,* v. 10, Apr. 1958, p. 119-125.

Investigation on relationship between current strength, diameter of electrodes and welding speed using bare and covered electrodes. Influence of current strength on mechanical properties of weld.
(K1a, K1g)

315-K.* (German.) **Effect of Welding Method on Discoloring of Welds During the Anodizing of Welded Joints in Aluminum and Aluminum Alloys.** J. Ruge and Zitzelsberger. *Schweissen und Schneiden,* v. 10, Apr. 1958, p. 125-131.

Experiments with various methods, materials, edge preparation, welding conditions; effects of microstructural processes produced by welding. Discoloring in homogeneous and heterogeneous alloys.
(K-general, L19; Al)

316-K.* **Welding Low-Alloy Steel Castings.** N. A. Chapin, C. H. Soldan and L. W. Songer. *Foundry Trade Journal,* v. 104, May 22, 1958, p. 597-600.

Fabrication and repair welding of large alloy steel castings for use in steam turbines operating up to 566° C. and at pressures up to 1.6 tons per sq.in. Castings vary in weight from 1000 lb. to about 35-36 tons.
(K-general, W11k, AY, 5-60)

317-K. Resistance Seam Welding Fits Into High-Speed Lines. C. E. Roth. *Iron Age,* v. 181, June 5, 1958, p. 130-131.

Integrated process line of this type in operation at Buick for production of Dynaflow transmission stator rings. (K3p, T21b)

318-K. Successful Welding for Maintenance. M. Kolb. *Petroleum Refiner,* v. 37, May 1958, p. 207-210.

(K-general, 18-71)

319-K. New Process Features Close Control of Brazing Heat. *Welding Engineer,* v. 43, June 1958, p. 38-39.

(K8; Al-b, Mg-b)

320-K. Welding of Gears Under Protection of Carbon Dioxide. N. N. Belous. *Svarochnoye Proizvodstvo,* no. 3, 1956, p. 20-22. (Iron and Steel Institute Translation no. 729.)

Previously abstracted from original. See item 260-K, 1956.
(K1; CN, AY)

321-K. 13KH3GNMA Welding Wire for the Automatic Welding of 30KLGSA Steel. T. M. Slutskaya. *Avtomaticheskaya Svarka,* Mar-Apr. 1956, p. 12-17. (Iron and Steel Institute Translation no. 730.)

Previously abstracted from original. See item 317-K, 1956.
(K1, W29h; ST)

322-K. (German.) **Economical Assembly of Copper Pipes With Soldered Fittings.** Wolfgang Schmidt. *Werkstatt und Betrieb,* v. 91, Apr. 1958, p. 165-168.

4 ref. (K7, K8; Cu, 4-60)

323-K.* (Book.) **Brazing Manual.** 28 p. 1958. All-State Welding Alloys Co., Inc. White Plains, N. Y.

Brazing sheet, tappings, tubings and assemblies of Cu, brass, steel, stainless steel, cast iron or Al. Techniques, properties and uses of fluxes. (K8)

324-K. (Book.) **Welding Handbook.** Section 1. 4th Ed. 1957. 560 p. American Welding Society, 33 East 39th St., New York 18, N. Y. $9.

Divided into five major sections, new sections being published at the end of each year. Major topics include standard definitions, conversion factors, thermal properties of welded joints, thermal and mechanical treatment of welds, inspection and tests, design techniques and safe practice. (K-general; 11-68)

325-K. (Book.) **Welding Directory, 1958/1959.** 1957. 680 p. Industrial Publishing Corp., 812 Huron Rd., Cleveland 15, Ohio. $6.50.

Directories of welding, brazing and cutting products; trade names; catalog and specification data; reference material; geographical buyers guide.
(K-general, 11-67, 11-62, 11-69)

Cleaning Coating and Finishing L

408-L. Automatic Control of Electroplating. H. Silman and K. M. G. Stewart. *Automation Progress,* v. 3, Feb. 1958, p. 44-47, 49.

(L17, 18-74)

409-L. New Phosphate Process Development Reduces Fixed Operating Costs. D. A. Paull. *Automotive Industries,* v. 118, Mar. 1, 1958, p. 23, 64.

(L14b)

410-L. What's New in Refractory Ceramic Coatings for Super Metal Alloys. *Ceramic Industry,* v. 70, Mar. 1958, p. 62-64.

Available materials, their handling, testing and application to meet needs of super and hypersonic speeds. Evaluates properties in terms of their chemical resistance at high temperatures, heat reflectivity, abrasion and friction resistance at high temperatures. (L27, P11, Q9n, R-general, 2-62; SGA-h)

411-L. Electrolytic Polishing of Stainless Steel. P. F. McKinney. *Chemical and Process Engineering,* v. 39, Feb. 1958, p. 59-60.

New type of surface finish which gives increased corrosion resistance, cleanliness and greater freedom at design stage. (L13p; SS)

412-L. Dip Painting and Flow Coating. *Electroplating and Metal Finishing,* v. 11, Apr. 1958, p. 105-109.
(L26n)

413-L. Dipping and Stove Enamelling Facilities at M. E. Beswick Ltd. *Electroplating and Metal Finishing,* v. 11, Apr. 1958, p. 121-122.
(L26, L27)

414-L. New Metal Finishing Installations at Vauxhall Motors Ltd. Pt. 1. The Canning Automatic Plating and Polishing Machines. *Electroplating and Metal Finishing,* v. 11, Apr. 1958, p. 125-134.

(L-general, L17, W3; Cu, Cr)

415-L. How to Flat Polish Stainless Steel. Thomas C. Smith. *Grinding and Finishing,* Apr. 1958, p. 34-36.

(L10b; SS)

416-L.* The Production of Multicolor Effects on Anodized Aluminum. V. F. Henley. *Institute of Metal Finishing, Bulletin,* v. 8, Spring 1958, p. 91-100.

Commercial processes for producing multicolor patterns and designs in anodic coatings. Method giving random patterns and accurate reproduction of design by processes where form of resists is mechanically applied to produce a pattern or where light sensitive compounds are used. 22 ref. (L19; Al)

417-L. Hard-Facing of Oil Tools. J. S. Goodwin. *International Acetylene Association, Official Proceedings,* 1956, p. 33-37.

(L24, T28; 6-69)

418-L. Science for the Coatings Technologist. Pt. 9. Metallic Pigments. E. S. Beck. *Metal Finishing,* v. 56, Apr. 1958, p. 52-55, 57.

Aluminum, leafing and nonleafing aluminums, metallics, hammered finishes. (L26n, 17-57; Al, NM-g30)

419-L. Finishing Pointers. Chromium Plating Thickness. J. B. Mohler. *Metal Finishing,* v. 56, Apr. 1958, p. 58, 67.

Decorative, engineering, cutting and die applications. (L17; *Cr*)

420-L.* Cold Chromium Plating in Russia. A. J. Steiger. *Metal Finishing,* v. 56, Apr. 1958, p. 56-57.

Russian machine tool specialists have been employing an electrolyte for cold plating which requires 1/3 to 1/4 of the current density of the conventional electrolyte and has better throwing power. Best composition is said to be 250 g. per l. of chromic acid and 4 g. per l. of ammonium fluoride. Plating is done at 15 to 25° C. and current density of 8 to 12 amp. per sq. dm. (L17, 1-67; *Cr*)

421-L. New Vinyl Paint Facilities at Poughkeepsie IBM. Henry D. Bowen, Jr. *Metal Finishing,* v. 56, Apr. 1958, p. 59-61.

(L26p)

422-L.* Chemical Polishing. Pt. 2. Lester F. Spencer. *Metal Finishing,* v. 56, Apr. 1958, p. 62-67.

Three major processes are phosphoric-nitric, phosphoric-nitric-acetic and phosphoric-sulphuric-nitric acid mixtures. Main industrial application for chemical polished Al is as a pretreatment for decorative anodizing. Two types of finish may be

obtained; a highly polished mirror type obtained by the slower acting solutions; a bright finish with usually lower specular reflectivity than that exhibited in mechanically polished surfaces. 39 ref. (L12g)

423-L. Science for Electroplaters. Pt. 35. Ion Exchange Properties. L. Serota. *Metal Finishing*, v. 56, Apr. 1958, p. 68-70.

(L17)

424-L. New Refrigerator Painting Line Features Flow-Coat Priming and Electrostatic Finishing at the Dundee Works of Astral Equipment Ltd. *Metal Finishing Journal (London)*, v. 4, Apr. 1958, p. 127-129, 131.

(L26n, T10a)

425-L. Micrograin Nickel Is Flexible, Yet Hard. *Metalworking Production*, v. 102, Apr. 25, 1958, p. 735-736.

(L18, M27c, Q23p; Ni)

426-L. Finishing Die Castings. Pt. 3. Barrel Finishing. Robert E. Earl. *Precision Metal Molding*, v. 16, Apr. 1958, p. 51-53, 58.

Barrel techniques for producing any of the five accepted classes of surface finishes on die castings. (L10d; 5-61)

427-L.* Finishing Die Castings. Pt. 4. Cleaning. A. T. Thibadeau. *Precision Metal Molding*, v. 16, May 1958, p. 51-52, 54, 64.

Mechanical and chemical cleaning methods for die castings prior to painting or plating. Solvents, alkaline solutions and acid detergent solutions used for specialized purposes. Ultrasonics and electrocleaning are effective. Formulations for electrocleaning of Zn, Cu, Pb, Al and Mg alloys. (L10, L12, L13; 5-61, Zn, Cu, Pb, Al, Mg)

428-L. Flame-Sprayed Ceramic Coatings. Thomas A. Dickinson. *Production*, v. 41, Mar. 1958, p. 84.

Use of powder-type metallizing gun to deposit refractory particles onto Al, Ti and other surfaces through an open gas flame conveys very little heat to materials with low melting temperatures because heat-softened powder particles cool rapidly after they are fused on deposition surface. (L27, W4g; Al, Ti, SS)

429-L. Bright Nickel Plating. D. J. Fishlock. **Pt. 3. Solution Control.** *Product Finishing*, v. 11, Mar. 1958, p. 87-101.

21 ref. (L17a; *Ni*)

430-L. The Production and Properties of Prepainted Steel Strip. *Sheet Metal Industries*, v. 35, May 1958, p. 395-399, 412a.

(L26n; ST, 4-53)

431-L. High Temperature Protective Coatings for Magnesium. C. R. Fitzgibbon, E. H. Miller and M. A. Glaser. Midland Industrial Finishes Co. (Wright Air Development Center). *U. S. Office of Technical Services*, PB 131073, Apr. 1957, 112 p. $3.

Calcium chromate pigmented primer containing 35% pigment and an aluminized topcoat. (L26n; Mg-b)

432-L. The Effect of Corrosion Preventives on Chromic Acid Films Adsorbed on Phosphate Coatings. W. D. McHenry and J. Doss. Rock Island Arsenal Laboratory. *U. S. Office of Technical Services*, PB 131296, 15 p. $.50.

(L14b, R10b)

433-L. Investigation of the Applicability of High Frequency Sound Waves (Ultrasonics) for Cleaning of Precision Parts. O. E. Mattiat and P. P. Zapponi. Clevite Research Center. (Wright Air Development Center). *U. S. Office of Technical Services*, PB 131361, June 1957, 76 p. $2.

(L10f)

434-L. Boronizing of Working Surfaces of Low Alloy Steel. V. D. Taran and L. L. Skugorov. *Vestnik Mashinostroeniya*, v. 37, no. 5, 1957, p. 62-65. (Henry Brutcher, Altadena, Calif., Translation no. 4084.)

(L15; AY, *B*)

435-L. (English.) **Variations of Concentration in the Layers of the Chrome Plating Bath Near the Electrodes, and Mechanism of the Electrodeposition of Chromium.** A. I. Levin and A. I. Falicheva. *Journal of Applied Chemistry of the USSR*, v. 29, no. 11, (1957), p. 1801-1809. (Translation by Consultants Bureau, Inc.)

10 ref. (L17a; *Cr*)

436-L. (English.) **Study of Anode Area in Electrolytic Polishing of Copper.** Masao Naruse and Akira Nannichi. *Tohoku University, Technology Reports*, v. 22, no. 1, 1957, p. 29-39.

(L13p; Cu)

437-L. (French.) **Causes, Remedies and Prevention of Silver-Plating Defects.** André Saglier. *Galvano*, v. 27, Apr. 1958, p. 27-30.

(Concluded.) (L17; *Ag*, 9)

438-L. (French.) **Present and Future Progress of Metal Finishing.** T. P. Hoar. *Galvano*, v. 27, Apr. 1958, p. 31-35.

(L-general)

439-L. (French.) **Electrolytic Polishing of Germanium and Silicon.** I. Epelboin and M. Froment. *Métaux Corrosion-Industries*, v. 33, Jan. 1958, p. 1-5.

4 ref. (L13p; Ge, Si)

440-L. (French.) **Microscopic Observation of Metallic Surfaces During the Course of Electrolytic Treatment.** I. Epelboin, M. Froment and G. Nomarski. *Revue de Metallurgie*, v. 55, Mar. 1958, p. 260-264.

(L13, M27)

441-L. (German.) **Enamelled Aluminum.** H. Kyri. *Aluminium*, v. 34, Apr. 1958, p. 213-216.

(L27; Al-b)

442-L. (German.) **Plating and Automation in Volkswagen Plant. Pt. 3.** Rolf O. Becker. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Mar. 1958, p. 93-101.

(Concluded.) (L17, T21c, 18-74)

443-L. (Italian.) **Anti-Corrosive Paints.** Carlo Rossi. *Vernici*, v. 14, Jan. 1958, p. 51-67.

Types of anti-rust paints, composition, vehicles, pigments, behavior in service. (L26n)

444-L. (Russian.) **Nickel Plating Process Without Application of Electric Current.** N. A. Solov'ev. *Vestnik Mashinostroeniya*, Mar. 1958, p. 82-84.

Nickel plating by chemical methods dispenses with need for electrical equipment; gives more even Ni coating on complex parts; increases antifriction qualities because of 7-9% phosphorus content. 13 ref. (L28; *Ni*)

445-L. (Spanish.) **Metal Protection; Dip Coating With Aluminum.** Manuel Serra. *Revista de Ciencia Aplicada*, v. 12, Jan-Feb. 1958, p. 31-42.

Characteristics and properties of Al coating; literature review; technical and scientific advances in various countries; summaries of Uyeno, Acco, zinc chloride, Nillson, Aldip, Mollerizing and Battelle Kacc processes. 58 ref. (L16, 10-54; *Al*)

446-L.* Anodic Corrosion of Metals and Alloys in Pyrophosphate Solutions. T. L. Rama Char. *Corrosion Prevention and Control*, v. 5, Apr. 1958, p. 37-38.

Anode efficiencies of close to 100% were obtained in Sn, Cu, Zn, Ni and Pb pyrophosphate plating solutions. Alloys of the metals were also studied. Effectiveness of solutions is increased by the use of additives. 7 ref. (L17a)

447-L. Surface Preparation for Protective Linings and Coatings Used in Critical Service. S. J. Oechsle Jr., and K. G. LeFevre. *Engineers' Digest*, v. 18, Nov. 1957, p. 485-514.

(L10, L13)

448-L. Non-Metallic Plating of Aluminum. John Starr. *Pacific Factory*, v. 88, Nov. 1957, p. 24-25.

Ceramic coatings of great wear resistance now produced electrochemically. (L27; Al-b)

449-L. New High-Speed Hot-Tinning System for Fine-Gauge Copper Wire. O. Haugwitz. *Draht, English Edition*, no. 34, Apr. 1958, p. 24-26.

New hot tinning system gives speeds of up to 5904 ft. per min. while providing a large output in a relatively small space with a notable lowering of operating costs. (L16, 4-61, Cu, *Sn*)

450-L. Electroplating of Screws and Other Small Parts. Pt. 4. Werner Peters. *Draht, English Edition*, no. 34, Apr. 1958, p. 28-32.

Quality control, removal of defective deposits, treatment of effluent in mass-production electroplating; costing methods in electroplating expressed in terms of plating period, plating system and ampere-hr. used. (L17, T7f)

451-L.* (French.) **Surface Treatments.** J. Bigeon. *Industrie Chimique*, v. 45, Feb. 1958, p. 34-40.

Cleaning prior to pickling; solvents, procedures, recovery of heavy solvents; hygiene and safety in cleaning departments; corrosion by solvents; stabilization of chlorinated solvents. (To be continued.) (L12h)

452-L.* (German.) **Precipitation of Bright Metal Deposits.** Karl Müller. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Apr. 1958, p. 131-134.

Theoretical considerations on mechanism of metal precipitation as electrocrystallization. Conditions of bright deposition. Geometrically directed dissolution (anodic polishing) and precipitation (bright deposition). (L17, L19, L13)

453-L.* (Italian.) **Problems in Surface Treatment of Aluminum.** F. Sacchi. *Alluminio*, v. 27, Feb. 1957, p. 63-71.

Special attention to structure of anodic films and sealing process; polishing, pickling, finishing of castings, architectural coloring and vitreous enameling. 26 ref. (L-general; Al)

454-L.* (Italian.) **Nickel Plating and Bright Chromium Plating of Light Alloys.** *Alluminio*, v. 27, Feb. 1958, p. 93-98.

Step-by-step description of process based on preliminary galvanizing; other types of processes and their applications; recommended thicknesses of deposits according to use; methods of determining adherence, thickness and corrosion resistance of coatings. 12 ref. (L17; EG-a39, *Ni*, *Cr*)

455-L. (Italian.) **High Polish Silver Plating. Pt. 2.** *Galvano Tecnica*, v. 9, Apr. 1958, p. 91-99.

Literature review. 25 ref. (L17; *Ag*)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

456-L. Metallizing. A Reclamation Tool. *Diesel Power,* v. 35, Nov. 1957, p. 48-50.

(L23)

457-L. New Plating Method Keeps Ultra-Strength Steel Ductile. William F. Hamilton and Myron Levine. *Metalworking,* v. 14, June 1958, p. 8.

(L17, SS)

458-L.* Finishing Die Castings. Pt. 2. Polishing and Buffing. P. R. Kalischer. *Precision Metal Molding,* v. 16, Mar. 1958, p. 59-60, 62-64.

Tabular presentation indicating optimum abrasives, grit, belt speeds, lubricants and contact wheels. (L10a, L10b; Al, Mg, Zn, 5-61)

459-L. A New Horizon in Barrel Finishing. *Precision Metal Molding,* v. 16, Mar. 1958, p. 65.

Addition of vibration to normal rotation so that the vibration action places abrasive media where bridging would ordinarily occur, or into guarded areas that would be normally missed. (L10d)

460-L. Developments in Decorative Plating. C. H. Sample. *Society of Automotive Engineers,* v. 22C, Jan. 1958, 14 p.

General discussion of Cr and Ni plating. 12 ref. (L17; *Ni, Cr*)

461-L. Quality of Decorative Plating. D. M. Bigge. *Society of Automotive Engineers,* v. 22A, Jan. 1958, 9 p.

Consideration of service performance of plated parts of automobiles, design of parts and unreliability of accelerated tests now in use. (L17c, R11)

462-L. Mechanical Descaling, Particularly Bend Descaling, in Wire Production. Clemens Eisenhuth. *Stahl und Eisen,* v. 77, Mar. 21, 1957, p. 324-334. (Iron and Steel Institute Translation no 544.)

Previously abstracted from original. See item 213-L, 1957. (L10g; ST, 4-61)

463-L. Coating of Metals With Synthetic Materials. G. Schulz. *Schwizer Archiv,* June 1956, p. 178-182. (Iron and Steel Institute Translation no. 678.)

Previously abstracted from original. See item 607-L, 1956. (L26)

464-L. (French.) **Clad Steel.** *Metallurgie et la Construction Mecanique,* v. 90, May 1958, p. 371-373.

Fabrication and properties. (L23, F23; ST, 4-53)

465-L.* (German.) Prefluxing in the Hot Dip Galvanizing Process. H. Bablik and M. Behlolavy. *Metalloberflache,* v. 11, Oct. 1957, p. 313-315.

Various methods of treating the base metal prior to immersion in the galvanizing bath. Drying process and drying time, removal of acid residues from pickling, temperature of pickling baths and its influence upon the galvanizing properties of the metal, and rinsing effects. Prefluxing with a mixture of ZNH_4Cl-$ZnCl_2$ showed best results in avoiding hard Zn precipitation. (L16; *Zn,* RM-q)

466-L.* (German.) On the Question of Current Distribution in Concentrated Electrolytic Solutions. P. Csokan. *Metalloberflache,* v. 11, Oct. 1957, p. 316-320.

Ion migration follows certain preferred directions in the electrolyte identical with field lines which depend on the geometric form of the electrodes. The ions of the electrolyte are polarized, creating dipole ions. Electrolytic field strength follows the laws of the electrostatic, while the current distribution is not yet mathematically accessible. (Concluded.) 7 ref. (L17b)

467-L.* (German.) Further Progress in Metal Spraying Techniques. Pt. 3. H. Reininger. *Metalloberflache,* v. 11, Oct. 1957, p. 329-333.

Improved thermospray guns of German, Russian and Czechoslovakian design, some utilizing natural gas instead of acetylene. Treatment of the base metal by cleaning and roughing the surface with electro abrasives or with purely electric methods or with sandblasting; also pickling methods. (To be continued.) (L23, L10c, L12g)

468-L.* (German.) Preservation of the Solderability of Silver-Plated Parts During Storage. A. Keil. *Metalloberflache,* v. 11, Oct. 1957, p. 334-335.

Best protection of Ag-plated parts against sulphur corrosion is found to be a thin Au plate. Another successful method is chromate passivation. A polyurethane resin coating affords good preservation and acts as a flux when soldered. (L17, R10c, K7; 8-62, *Ag, Au*)

469-L. (German.) **Protection Against Corrosion by the Diffusion of Chromium Into the Surface of Workpieces.** G. Becker. *Werkstatt und Betrieb,* v. 91, Apr. 1958, p. 169-170.

(L15; ST, *Cr*)

470-L. (German.) **Designing Structures to Make Painting and Protection Against Rust Easy.** K. A. van Oeteren. *Werkstoffe und Korrosion,* v. 9, Apr. 1958, p. 197-202.

5 ref. (L26, T26, 17-51)

471-L. (Russian.) **Application of Sandblasting Machines in Radiator Manufacture.** E. M. Notkin, G. E. Kur and N. M. Aronshtein. *Liteinoe Proizvodstvo,* v. 2, Feb. 1958, p. 1-7.

With properly determined air blast parameters sandblasting can be effectively applied to the production of radiator cores. (L10c, W2r)

472-L. (Book.) **Metal Finishing Guidebook Directory.** 26th Ed. 1958. 678 p. Finishing Publications Inc., 381 Broadway, Westwood, N. J.

Plant engineering, surface preparation, plating procedures, control, analysis and testing; directories of product classifications and trade names. (L-general, 11-67)

M Metallography

Constitution and Primary Structures

240-M.* Solubility of Nickel and Chromium in Molten Lead. T. Alden, D. A. Stevenson and J. Wulff. *AIME Transactions,* v. 212, Feb. 1958, p. 15-17.

A portion of the liquidus curve has been determined for the binary alloy systems Ni-Pb and Cr-Pb. Solubility of Ni is 0.53 at.% at 372° C. and 18.63 at. % at 1200° C.; Cr shows low solubility, 0.634 at. % at 1210° C; Mo and W were also studied and found insoluble in Pb, less than 0.005 at. % at 1200° C. 13 ref. (M24b; Pb, Ni, Cr)

241-M.* Delta Phase Field of the U-Zr Equilibrium Diagram. J. F. Duffey and C. A. Bruch. *AIME Transactions,* v. 212, Feb. 1958, p. 17-19.

On the basis of metallographic and cooling-rate studies of 15 U-Zr alloys, a new version of the delta phase region of the U-Zr phase diagram is proposed. 7 ref. (M24b; U, Zr)

242-M.* InSb-Sn System. R. N. Zitter. *AIME Transactions,* v. 212, Feb. 1958, p. 31-32.

Intermetallic compound InSb, which is now being investigated, is similar to gray tin in its lattice structure and lattice parameter (face-centered cubic zinc blende type for InSb with lattice parameter of 6.476 A, and diamond structure for gray tin with lattice parameter of 4.46 A.) (M24d; In, Sn, Sb)

243-M. Comments on Inverse Pole Figure Methods. M. H. Mueller, W. P. Chernock and Paul A. Beck. *AIME Transactions,* v. 212, Feb. 1958, p. 39-40.

A three-dimensional inverse pole figure cannot be adequately replaced by two (or even three) separated two-dimensional inverse pole figures. The use of separate inverse pole figures (e.g., for the rolling direction and for the normal direction), appears to offer no significant advantage over a combination of two ordinary pole figures, (e.g., (111) and (200) for a face-centered-cubic metal), in spite of the considerable amount of computation necessary for their construction. 4 ref. (M23c, M26c)

244-M. A Pseudo-Binary in the U-Cb-C System. R. B. Roof, Jr., and J. J. Lombardo. *AIME Transactions,* v. 212, Feb. 1958, p. 50-51.

End products of the presumed pseudo-binary, UC and CbC, were prepared by vacuum arc melting techniques using a carbon electrode tip to remove the possibility of contamination of the binary by a third element during melting. Metallographic results strongly support the X-ray diffraction evidence that the unknown face-centered-cubic phase is a monocarbide of uranium and columbium. (M24c, U, Cb, C)

245-M.* Titanium-Rich Corner of the Ti-Al-Si System. F. A. Crossley and D. H. Turner. *AIME Transactions,* v. 212, Feb. 1958, p. 60-63.

Phase relationships in the temperature interval 600 to 1200° C. Metallographic examination of long-time isothermally annealed specimens was the means of investigation. 8 ref. (M24c; Ti, *Al,* Si)

246-M. The System InSb-InBi. E. A. Peretti. *AIME Transactions,* v. 212, Feb. 1958, p. 79.

Attention focused on the low-indium end of the ternary diagram. (M24c; In, *Sb, Bi*)

247-M.* Etch-Pit Studies on Silicon. W. J. Feuerstein. *AIME Transactions,* v. 212, Apr. 1958, p. 210-212.

Etch pits with good contour definition and lineage structure in Si single crystals have been developed. A dependence on angular deviation from the growth axis and spiral-type etch pits has been observed. Screw-type etch pit density increases with increasing angular deviation from the growth axis, reaching a maximum in the plane normal to the growth axis. 7 ref. (M26s, M20q; Si, 14-61)

248-M. Notes on the R-Phase. J. B. Darby, Jr., B. N. Das, Y. Shimomura and P. A. Beck. *AIME Transactions,* v. 212, Apr. 1958, p. 235-236.

Phase located in the Cr-Mo-Co system at 1300° C., and formerly designated as the D-phase must now

be considered the same as the R-phase, previously found in the same system at 1200° C. 4 ref. (M24c, Cr, *Mo, Co*)

249-M. Iron-Rich Phase in Aluminum Bronzes. James A. Mullendore and David J. Mack. *AIME Transactions,* v. 212, Apr. 1958, p. 252-253.

Compositions and lattice parameters. (M24e, M26; Cu-s, *Al, Fe*)

250-M. Electroshaping of Copper Single Crystals. D. H. Avery, M. L. Ebner and W. A. Backofen. *AIME Transactions,* v. 212, Apr. 1958, p. 256-259.

Procedure of accelerated electropolishing to prepare a gage section in cylindrical single-crystal Cu specimens for fatigue studies. Surface produced is both polished and dimensionally accurate to ± 0.001 in. with no distortion being evidenced in back-reflection photograms of the Laue type. Time for shaping is substantially less than that required for acid cutting. (M20p, Q7, 1-60; Cu, 14-61)

251-M. The Effect of Dissolved Tin on the Lattice Parameter of Copper. A. F. Andresen. *AIME Transactions,* v. 212, Apr. 1958, p. 259-260.

5 ref. (M26, 2-60; Cu, *Sn*)

252-M.* The Modification of Aluminum-Silicon Alloys by Sodium. R. C. Plumb and J. E. Lewis. *Institute of Metals, Journal,* v. 86, Apr. 1958, p. 393-400.

Measurements by autoradiography and activation analysis revealed the distribution of Na in the microstructures of 7.5% Si aluminum alloys modified by the addition of various amounts of Na. Electron microscope studies indicate that there is no fundamental difference between modification by chill casting and modification by Na addition. 12 ref. (M27d; Al-b, *Si, Na*)

253-M. Arrangements of Dislocations in Plastically Bent Silicon Crystals. J. R. Patel. *Journal of Applied Physics,* v. 29, Feb. 1958, p. 170-175.

Single crystals of silicon were plastically bent at an elevated temperature. The average etch-pit density after deformation is approximately two to three times higher than the calculated dislocation density. Prolonged annealing close to the melting point results in polygonization or the alinement of etch pits perpendicular to the active slip planes. Satisfactory agreement was obtained between the densities of etch pits in the annealed and polygonized specimens and the predicted dislocation densities. 14 ref. (M26b; Si, 14-61)

254-M. Thermally Precipitated Phases and Their Distribution in an Aluminum-Silicon-Cadmium Alloy. R. E. Marburger and A. W. Schluchter. *Journal of Applied Physics,* v. 29, Feb. 1958, p. 184-188.

X-ray and electron diffraction and electron microscopy used to study the composition and distribution of the precipitated phases in a 4% Si, 1% Cd aluminum alloy as a function of thermal history. Thin precipitated crystallites detected in extraction replicas of specimens tempered above 400° F. and identified as elemental Si by selected area electron diffraction. (M24c, N7; Al, *Cd, Si*)

255-M. Zn_3As_2, a Semiconducting Intermetallic Compound. G. A. Silvey. *Journal of Applied Physics,* v. 29, Feb. 1958, p. 226-227.

7 ref. (M26q, P15g; Zn-b, *As*)

256-M. Solid-Liquid Equilibrium in the Lithium-Lithium Hydride System. Charles E. Messer, Edwin B. Damon, P. Calvin Maybury, John Mellor and Regina A. Seales. *Journal of Physical Chemistry,* v. 62, Feb. 1958, p. 220-222.

8 ref. (M24b, N12; *H,* Li)

257-M. The Standardization of Photographic Exposures in Metallurgical Microscopy. L. E. Samuels, T. O. Mulhearn and R. M. Robb. *Metallurgia,* v. 57, Apr. 1958, p. 207-212. (M21)

258-M. Generation of Imperfections in Germanium Crystals by Thermal Strain. P. Penning. *Philips Research Reports,* v. 13, Feb. 1958, p. 79-97.

22 ref. (M26s, Q25p; Ge)

259-M. The Constitutional and Aging Characteristics of Magnesium-Thorium and Magnesium-Thorium Ternary Alloys. A. S. Yamamoto, E. J. Klimek and W. Rostoker. Armour Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121939, Feb. 1957, 76 p. $2.

(M24b, M24c, N7a; Mg, *Th, Zn, Zr*)

260-M. Investigation of Fe-Mn-Cr-N-C System for Heat Resistance and Oxidation Resistance Between 1200 and 2000° F. C. Hsiao and E. J. Dulis. Crucible Steel Co. of America. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131563, 158 p. $4.

(M24d, Q-general, R1h, 2-62; SS)

261-M. Partition of Soluble Carbon in Ti-6Al-4V Alloy. R. D. Seibel, R. L. Beck and L. E. Olds. University of Denver. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131603, Nov. 1957, 78 p. $2.

Microradiographic method for measurement of the microdistribution of embrittling interstitial-type solutes in alpha-beta Ti alloys. The method was based upon measurements of either lattice parameters or internal friction. (M23n, Q26s; Ti, *Al, V*)

262-M. Study of Microdistribution of Interstitial Elements in Titanium by Internal Friction Techniques. D. Gupta and S. Weinig. New York University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131613, Nov. 1957, 52 p. $1.50.

(M27, Q22, Q27; Ti)

263-M. Phase Relationships in Magnesium Alloys. J. J. Park and L. L. Wyman. National Bureau of Standards. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131622, Oct. 1957, 33 p. $1.

Studied by thermal, X-ray and metallographic methods. The Mg-rich portions of the binary diagrams of Mg plus the rare earth metals lanthanum, cerium, praseodymium and neodymium were determined. (M24b; Mg, EG-g)

264-M. Nonmetallic Inclusions in Magnesium-Treated Iron for Rolling-Mill Rolls. A. E. Krivosheev and I. E. Lev. *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 18-19. (Henry Brutcher, Altadena, Calif., Translation no. 4094.)

Previously abstracted from original. See item 303-M, 1957. (M27, M23, CI-r, 9-69)

265-M. Nonmetallic Inclusions in Spheroidal Graphite Cast Iron. P. P. Arsent'ev and Yu. Ya. Orlova. *Liteinoe Proizvodstvo,* no. 4, Apr. 1957, p. 23-24. (Henry Brutcher, Altadena, Calif., Translation no. 4096.)

Previously abstracted from original. See item 303-M, 1957. (M27, M23, CI-r, 9-69)

266-M. X-Ray Study of the System Vanadium Carbide (VC)-Tungsten Carbide (WC). M. A. Gurevich and B. F. Ormont. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1958, p. 7-10. (Henry Brutcher, Altadena, Calif., Translation no. 4107.)

(M24d; V, W, C, 14-68)

267-M. Phase Diagram of Chromium-Columbium System. V. A. Eremenko, G. V. Zudilova and L. A. Gaevskaya. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1958, p. 11-16. (Henry Brutcher, Altadena, Calif., Translation no. 4108.) (M24b; Cr, Cb)

268-M. Nature of Interaction Between Titanium Boride and the Iron-Group Metals. G. V. Samsonov. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1958, p. 35-38. (Henry Brutcher, Altadena, Calif., Translation no. 4122.)

Phase diagrams TiB_2-Fe, TiB_2-Co and TiB_2-Ni. Data on shrinkage in sintering, on intersolubilities, eutectic compositions and temperatures. Promise of titanium boride as a constituent of cemented carbide compositions. (M24c, 6-69; B, Ti, Fe, Co, Ni)

269-M. Microstructure of Surface Layer Formed on Steel Hard Faced by Electrosparking. V. A. Belyanin. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1958, p. 55-57. (Henry Brutcher, Altadena, Calif., Translation no. 4127.)

(M20q, M27, 8-68; ST)

270-M. On the Oxygen Content of Wustite in Equilibrium With Various Gas Phases. N. A. Hovgard and P. N. Jensfelt. *Jernkontorets Annaler,* v. 140, no. 7, 1956, p. 467-492. Henry Brutcher, Altadena, Calif., Translation no. 4141.)

Previously abstracted from original. See item 365-M, 1957. (M24; Fe)

271-M. Influence of Stresses on the Lattice Constant of Austenite. E. Scheil and E. Saftig. *Archiv für das Eisenhüttenwesen,* v. 28, no. 1, 1957, p. 49-51. (Henry Brutcher, Altadena, Calif., Translation no. 4162.)

Study of an iron-nickel alloy with 30% Ni and 0.25% Mn for austenite-lattice constant in specimens containing various amounts of martensite. (M26p, 3-66; Fe, Ni)

272-M. Formation of a Cubic Nitride in Aluminum-Containing Steels. Walter Koch, Christal Ilschner-Gensch and Helga Rohde. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 701-706. (Iron and Steel Institute Translation no. 900.)

Previously abstracted from original. See item 78-M, 1957. (M21, M22; AY, *Al,* 14-68)

273-M.* (English.) New Oxidizing Method for Revealing Austenitic Grain. Yunoshin Imai and Hiroshi Hirotani. *Tohoku University, Science Reports of the Research Institutes,* v. 9, Dec. 1957, p. 467-475.

Oxidizing method for revealing austenitic grain boundaries in carbon and alloy steels. Polished specimens heated in high vacuum at austenitizing temperatures oxidized from 3 to 5 sec. by introducing air dipped into molten borax, then quenched in water. Method found to be reliable and technique simple. 8 ref. (M23, M27f; ST)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

274-M. (French.) **New Metallographic Process for Copper.** Pierre A. Jacquet. *Cuivres-Laitons-Alliages,* no. 42, Mar-Apr. 1958, p. 37-40.

Macroscopic and microscopic structure examination of Cu alloys (including inside walls) through inexpensive, nondestructive electrolytic process. 4 ref. (M23s; Cu)

275-M. (German.) **Microscopic Investigations on the Banate Copper Slag.** C. Superceanu. *Revue de Métallurgie (Bucarest),* v. 2, 1957, p. 159-172.

Study revealed 23 definite mineral compounds classified into four groups as metal, sulphide, oxide and silicate phases. Structures, dimensions and magnetic propeties used in evaluating these metallurgical products of Cu and Fe. 15 ref. (M21c, M27; Cu, Fe, RM-q)

276-M.* (German.) **Structural Investigations on System Copper-Antimony.** Eberhard Günzel and Konrad Schubert. *Zeitschrift für Metallkunde,* v. 49, Mar. 1958, p. 124-133.

Investigations into superstructures of phases with A3-substructure in powders and monocrystals. Description of four phases and their function intensities. Relationship of the phases to the known A3-superstructures. (M24b; Cu, Sb)

277-M. (German.) **Field Electron Emission of Palladium.** Ernst Karl Caspary and Erich Krantz. *Zeitschrift für Metallkunde,* v. 49, Mar. 1958, p. 147-152.

Field electron microscope investigations. (M21e, Pd)

278-M. Electron Diffraction From Crystals Containing Stacking Faults. Pt. 2. M. J. Whelan and P. B. Hirsch. *Philosophical Magazine,* v. 2, Nov. 1957, p. 1303-1324.

Electron optical experiments on thin foils of stainless steel; results are in good agreement with theory. 7 ref. (M22h, M26s; SS, 4-56)

279-M. Indium-Rich Indium-Magnesium and Indium-Lithium Alloys. J. Graham and G. V. Raynor. *Philosophical Magazine,* v. 2, Nov. 1957, p. 1354-1363.

For comparison with the results obtained from alloys of indium with solute metals from Group IIB of the periodic table, the lattice spacings of In-Mg and In-Li alloys have been measured. 11 ref. (M24b, M26; In, Mg, Li)

280-M. Band Structure of the Transition Metals. N. F. Mott and K. W. H. Stevens. *Philosophical Magazine,* v. 2, Nov. 1957, p. 1364-1386.

45 ref. (M25, P15, P16; Cr, Fe, Co, Ni)

281-M. (French.) **Electrolytic Polishing of Carbon and Low-Alloy Steels in Fused Salts Revealing the Structure and Real Texture of the Austenite.** Zygmunt Wojcik. *Métaux Corrosion-Industries,* v. 33, Feb. 1958, p. 53-70.

Sensitivity of method permits displaying phenomena associated with the mechanism of grain growth and internal structure of the austenite, as well as physical heterogeneities and a new phenomenon of "figures of decrystallization" associated with the mechanism of anodic solution. 40 ref. (M20p, N3n, M27d; CN, AY)

282-M. (Rumanian.) **Some Problems in the Metallographic Study of Pieces Sintered From Metal Powders.** Alexander Domsa and Horia Colan. *Studii si Cercetari de Metalurgie,* v. 2, no. 1-2, 1957, p. 99-112.

8 ref. (M21; 6-72)

283-M. X-Ray Investigation on Lattice in Cold Drawn Steel Wire. Ya. S. Umansky and D. M. Zlatoustovsky. *Metallovedenie i Obrabotka Metallov,* Mar. 1958, p. 11-15. (Henry Brutcher, Altadena, Calif., Translation no. 4172.)

Study of microstress and static distortion of lattice depending on drawing speed and degree of deformation. Effect of temperature. Distribution of microstress and static distortion in cross cut of wire. Favorable effect of high speed in drawing. 14 ref. (M27, M21f; ST, 4-61, 9-74)

284-M. (Russian.) **Electron Microscope Two-Step Method for Study of Metal Fractures.** A. N. Pilyankevich. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 314-315.

(M21e, Q26)

285-M. (Russian.) **X-Ray Camera for Precise Measurement of Deflection Angle in Metal Crystals.** K. P. Mamedov and A. V. Kerimbekov. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 353.

(M21f, M26, 1-53)

286-M.* Etch Figures on Silicon Iron. Frantisek Kroupa. *Czechoslovak Journal of Physics,* v. 8, 1958, p. 186-195.

Steps, which in some points of the (110) planes become spiral pits, were obtained on the surface of silicon iron by electrolytic etching. The height of the steps, which was from tens to 1000 A, was measured by multiple beam interference. An explanation of the step-like etching is proposed and some of the mechanisms which can lead to the production of etch spirals with the above height of the steps are given. 21 ref. (M26s, M20q; Fe, *Si*)

287-M.* The Nature of the Real Crystal. F. C. Frank. *Institute of Metals, Journal,* v. 86, 1956-1957, p. 581-586.

Historical review of the growth of knowledge in crystal physics. Important steps include Taylor and Orowan's introduction of crystal dislocations; Smialowski's structure and Buerger's concept of lineage structure. 29 ref. (M26)

288-M. Thermal Expansion of Iron Ditelluride. J. P. Llewellyn and T. Smith. *Physical Society Proceedings,* v. 70B, Dec. 1, 1957, p. 1113-1122.

18 ref. (M23r; Fe, Te)

289-M. Stacking Faults and Dislocations in Copper-Aluminum and Cobalt-Nickel Alloys. J. W. Christian and J. Spreadborough. *Physical Society Proceedings,* v. 70B, Dec. 1, 1957, p. 1151-1161.

17 ref. (M26b; Al, Co, Cu, Ni)

290-M. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Pt. 6. Metallurgical Examination of Austenitic and Ferritic Steels After a Long Period of Creep Stressing. Alfred Krisch. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 305-310. (Iron and Steel Institute Translation no. 676.)

Previously abstracted from original. See item 338-M, 1957. (M27d, M26r, Q3, SGA-h, AY)

291-M. High-Temperature Microscopy. Prempl Rys. *Neue Hütte,* v. 2, 1957, p. 489-497. (Iron and Steel Institute Translation no. 698.)

Previously abstracted from original. See item 378-M, 1957. (M21, 2-62, M27; ST)

292-M. (English.) **Investigation of the System PbTe—PbSe.** E. I. Elagina and N. Kh. Abrikosov. *Academy of Sciences of the USSR, Proceedings,* v. 3, Nov-Dec. 1956, p. 663-665. (Translation by Consultants Bureau, Inc.)

Structural diagram of the system PbTe—PbSe with the aim of determining the physicochemical nature of the alloys in this system. 11 ref. (M24c; Pb, Se, Te)

293-M. (English.) **Investigation of Metallic Compounds in Nickel Alloys Containing Aluminum.** R. B. Golubtsova and L. A. Mashkovich. *Academy of Sciences of the USSR, Proceedings,* v. 3, Nov-Dec. 1956, p. 701-704. (Translation by Consultants Bureau, Inc.)

8 ref. (M24; Ni, *Al, Cr, Ti*)

294-M.* (English.) **X-Ray Study of Cold Worked Metal Single Crystals.** Tomiya Sutoki and Koichi Nakajima. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 10, Apr. 1958, p. 77-84.

Change in the reflected intensity of X-ray due to the deformation of single crystals of Al and Zn examined with microphotometer by using Cu-K radiation. In Al single crystals, a large change in the relative intensity of (111) reflections was observed with an increase of the deformation. (M26, M22g; Al, Zn, 14-61)

295-M.* (French.) **Electron Diffraction Study of Surface Oxidation of Silicon Carbide Crystals.** Pierre Michel and Richard Riwan. *Comptes Rendus,* v. 246, Mar. 10, 1958, p. 1542-1544.

Study of oxidation of pre-roughened face (0001) of SiC crystals heated in air at 1150° C. Under conditions described, oxidation leads to formation of thin film of crystobalite having orientation different from that of crystal. 5 ref. (M26r, M22h; Si)

296-M. (French.) **Fast Method for Preparing Thin Metal Section for Direct Examination in the Electron Microscope.** Paul Miraud and Adrien Saulnier. *Comptes Rendus,* v. 246, Mar. 17, 1958, p. 1688-1691.

(M20p, M21e)

297-M.* (French.) **Method of Preparing Pure Aluminum Bicrystals Having Predetermined Orientations.** Claude Goux. *Comptes Rendus,* v. 246, Mar. 17, 1958, p. 1691-1693.

Two suitably oriented monocrystalline seeds are welded under vacuum to a polycrystalline platelet; relative orientations of these seeds are communicated to platelet by progressive fusion and crystallization. A portion of resulting bicrystalline material removed by electrolytic sawing can in turn be used to prepare a new bicrystal. (M26n, M20; Al-a)

298-M.* (German.) **On a Specific Texture Observed on the Surface of Tin Plated Sheets.** Hans Eggers. *Archiv für das Eisenhüttenwesen,* v. 28, Dec. 1957, p. 777-783.

On sheets where the tin plate was stripped after plating a surface texture was observed similar to the texture of wood. This texture appeared only on hot dipped sheets, not on galvanized materials. 9 ref. (M26c; ST, *Sn,* 8-12)

299-M.* (German.) **Electrochemical Observations During Metallographic Etching.** Hans Jurgen Engell. *Archiv für das Eisenhüttenwesen,* v. 29, Jan. 1958, p. 73-76.

Electrochemical processes during etching with reducing or oxidizing acids; current density-potential diagrams determined as an aid to the selection of the correct etching solution. (M20q)

300-M.* (German.) **Conditions of Equilibrium in the System Copper-Beryllium-Aluminum. Pt. 2. Additional Investigation Concerning the Solubility-Isotherms, Structures and Their Formation.** Otto Nickel. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 57-62.

Phase boundaries in the area of transformation between $\alpha/\alpha + \beta$, $\alpha/\alpha + \gamma$ and $\alpha + \beta/\beta$ were determined by X-ray Debye methods. Values for intensity of X-ray lines are found by mathematical methods and are compared with the experimental results. A stripe-type structure was found to be similar to those found in In-Cd alloys. 31 ref. (M24c; Ce, Be, Al)

301-M.* (German.) **Grain Boundary Precipitation as a Function of Orientation in Copper-Beryllium With Random Structure.** Wolfgang Gruhl, Dieter Ammann and Anni Stegmann. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 75-79.

Orientation of grain boundaries is connected with the amount of precipitation along the boundaries. This has been previously proven on material with preferred orientation axes, such as fiber-type textures. In random structures in 1.8% Be alloys, a relationship between precipitation and orientation of two adjacent crystals was found. Strength of precipitation increases with increasing orientation angle. 15 ref. (M27f, N7; Cu-b, *Be*)

302-M. (German.) **The Phase Diagrams of the Systems Gallium-Cadmium and Gallium-Zinc.** Theo Heumann and Bruno Predel. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 90-95.

(M24b, Ga, Cd, Zn)

303-M.* (Polish.) **Index of the Degree of Microsegregation in Commercially Pure and High-Purity Aluminum.** Antoni Piotrowski. *Archiwum Hutnictwa,* v. 2, 1957, p. 377-390.

Value of electrochemical index for microsegregation depends on purity of the Al and is notably smaller for high purity than for commercial purity. After homogenization annealing the index decreases much more for pure Al (average about 50%) than for commercial (about 16%). 7 ref. (M27a, 9-69; Al-a)

304-M. (Russian.) **Phase Analysis of Complex Titanium Alloys.** N. I. Blok, A. I. Glazova and N. F. Lashko. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 141-145.

(M24d, S11g; Ti-b)

305-M. (Book.) **Typical Microstructures of Cast Metals.** 1957. 224 p. Institute of British Foundrymen, St. John St., Chambers, Deansgate, Manchester 3, England. 84 s.

Microstructure with chemical composition and mechanical properties; cast iron, cast steel, nonferrous and light-alloy products. (M27; 5)

N Transformations and Resulting Structures

215-N.* **Solid Solution Hardening.** W. R. Hibbard, Jr. *AIME Transactions,* v. 212, Feb. 1958, p. 1-5.

Evidence confirms previous findings that models of solution strengthening depending solely on lattice parameter changes are incomplete. Direct evidence for the Suzuki interaction of chemical effects was obtained from alloys with constant lattice parameter, for which solution strengthening was nearly independent of temperature from 300 to 20° K. 7 ref. (N7a, N12p)

216-N.* **Micrographic Investigation of Precipitation in Pb-Sn Alloys.** D. Turnbull and H. N. Treaftis. *AIME Transactions,* v. 212, Feb. 1958, p. 33-39.

Precipitation of Sn from Pb-Sn alloys (lead-rich) occurs by the nucleation and growth of hemispherical cells which consist of Sn lamellae interspersed in the depleted solid solution. Nucleation and growth of these cells and the Sn interlamellar spacing at various compositions and temperatures. Interlamellar spacing increases approximately as the reciprocal of the logarithm of the supersaturation ratio. 12 ref. (N7b; Pb, *Sn*)

217-N.* **Solid Solubility of Uranium in Thorium and the Allotropic Transformation of Th-U Alloys.** Wendell B. Wilson, Alfred E. Austin and Charles M. Schwartz. *AIME Transactions,* v. 212, Feb. 1958, p. 52-55.

High-temperature X-ray diffraction studies were conducted with Th-U alloys with up to 10% U. Solid solubility of U in Th as a function of temperature was determined by the method of lattice parameters. Thorium will dissolve up to 2.5% U at 950° C., 4.5% U at 1150 and 7.5% U at 1250° C. Determinations were made of the temperature of the transition of Th and of the effect of U upon the transition. 12 ref. (N12p, N6p; Th, U)

218-N.* **Comparison of the Structure of the Omega Transition Phase in Three Titanium Alloys.** S. A. Spachner. *AIME Transactions,* v. 212, Feb. 1958, p. 57-59.

Analysis of the powder patterns of the omega transition phase in three binary Ti alloys containing 8% Cr, 13% Mo, and 15% V, respectively, showed that all could be indexed on an orthorhombic unit cell. Unit-cell dimensions were all quite similar. There is evidence for the occurrence of more than one transition phase in Ti-Cr and Ti-V alloys. 4 ref. (N11h, M26; Ti-b)

219-N.* **Information on "Nuclei" for Secondary Recrystallization in Si-Fe.** C. G. Dunn and P. K. Koh. *AIME Transactions,* v. 212, Feb. 1958, p. 80-84.

Microstructure, magnetic torque and texture data before and after grain growth were obtained on two 3.25% Si-Fe specimens having initially the same cold rolled textures and the same primary recrystallization textures. The textures of the two specimens obtained by grain growth were different. Texture changes observed are considered to favor the oriented-nucleation growth-selectivity theory more than the oriented-growth theory. 17 ref. (N5h, M26c; Fe, *Si*)

220-N. Steady-State Diffusion in Substitutional Solid Solutions. A. S. Yue and A. G. Guy. *AIME Transactions,* v. 212, Feb. 1958, p. 107-112.

Effects of a prolonged flux of Zn atoms through the alpha solid solution of Zn in Cu. 17 ref. (N1c; *Zn,* Cu)

221-N.* **Rate of the Carbon-Oxygen Reaction in Liquid Iron.** N. A. Parlee, S. R. Seagle and R. Schuhmann, Jr. *AIME Transactions,* v. 212, Feb. 1958, p. 132-137.

Rates of CO evolution and CO absorption were measured for liquid iron alloys containing from 0.15 to 4.4% C, using a modified Sieverts apparatus. Data are interpreted on the hypothesis that the C-O reaction rate is controlled by oxygen diffusion across the boundary layer at the gas-metal and crucible metal surfaces. 7 ref. (N16M, P12; Fe)

222-N. Nucleation of Solid-State Transformations. Morris Cohen. *AIME Transactions,* v. 212, Apr. 1958, p. 171-183.

The 1957 Institute of Metals Division Lecture. 46 ref. (N2, N3)

223-N.* **Hydrogen Solubility and Removal for Titanium and Titanium Alloys.** W. M. Albrecht and M. W. Mallett. *AIME Transactions,* v. 212, Apr. 1958, p. 204-210.

Solubilities of hydrogen in Ti and several of its alloys were determined at 600 to 1000° C. and pressure of 0.05 to 10 microns of mercury. Solubility increases with increasing beta phase. Factors found to affect degassing rates are specimen size and presence of thick surficial oxide. Removal of hydrogen by heating in vacuum and in flowing inert atmospheres was studied. 10 ref. (N15d; Ti, *H*)

224-N. Effects of the Proeutectoid Ferrite Reaction on the Formation of Pearlite. H. I. Aaronson. *AIME Transactions,* v. 212, Apr. 1958, p. 212-218.

Effects discussed in terms of the influence of transformation strain energies and of the interfacial free energy of austenite-ferrite boundaries on the rate of pearlite nucleation. 13 ref. (N8h, N8j)

225-N.* **Further Evidence of Zoning in a Nickel-Chromium-Titanium-Aluminum Alloy.** N. E. Rogen and N. J. Grant. *AIME Transactions,* v. 212, Apr. 1958, p. 218-219.

Investigation to establish whether atomic re-arrangements (zoning) occur in the supersaturated solid solution prior to the actual precipitation of the gamma-phase. 7 ref. (N7, M25; Ni, Cr, Ti, Al)

226-N.* **Environmental Effects on Hydrogen Permeation Through Steel During Abrasion.** D. E. Swets, R. C. R. Frank and D. L. Fry. *AIME Transactions,* v. 212, Apr. 1958, p. 219-220.

Recent experiments have shown that another group of operations, namely, sanding and grinding, must be added to the already well-established list of phenomena that cause hydrogen to permeate steel. (N1, G18, L10a; ST, *H*)

227-N. Effect of Deformation and Low Temperatures on the Structures of AgCd and AuZn. D. M. Masson and C. S. Barrett. *AIME Transactions,* v. 212, Apr. 1958, p. 260-265.

Martensitic transformations have been found in AgCd both upon cold working at room temperature and cooling to lower temperatures. Crystal structures of the transformation products were found to be close-packed hexagonal in the first case and orthorhombic in the latter. Transformation characteristics also were studied. 22 ref. (N6q, M26, 3-68; Ag, Cd, Au, Zn, 14-68)

228-N.* **Phase Transformations in Titanium-Rich Alloys of Titanium and Cobalt.** F. R. Swann and J. G. Parr. *AIME Transactions,* v. 212, Apr. 1958, p. 276-279.

Quenched structures were studied

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

in alloys containing up to 12.5% Co. Subsequent decomposition of a 10% Co retained-beta phase alloy was investigated using metallographic and X-ray diffraction methods. Hardness measurements also were made during the decomposition process. Precipitation of Ti_2Co is by nucleation and growth. 9 ref. (N6, N7; Ti, *Co*)

229-N. Electron Micrographic Study of Aging in a Beta Titanium Alloy. F. C. Holden and A. P. Young. *AIME Transactions*, v. 212, Apr. 1958, p. 287-288.

6 ref. (N7b, Ti)

230-N.* Precipitation of Nickel and Copper From Supersaturated Solutions in Germanium. P. Penning. *Philips Research Reports*, v. 13, Feb. 1958, p. 17-36.

Both Cu and Ni atoms can be located at lattice sites (substitutional atoms) or at interlattice sites (interstitial atoms). An exchange between the two types of atom is possible by the reaction: substitutional atom $\rightleftarrows$ interstitial atom + vacancy. The vacancy is an acceptor with only one level in the lower half of the forbidden band, located at 0.02 eV from the valence band. 18 ref.
(N7b, M26s; Ni, Cu, Ge)

231-N. Precipitation of Lithium in Germanium. F. J. Morin and Howard Reiss. *Physics and Chemistry of Solids*, v. 3, no. 3/4, 1957, p. 196-209.

Studied by resistivity methods. The kinetics of precipitation follow an exponential law with constants predicted by theory. This indicates that the precipitate particles are approximately spherical. Evidence is found that nucleation centers are vacant Ge lattice sites. 42 ref.
(N7b; Ge, Li)

232-N. Mechanism and Kinetics of Age Hardening in Mg-Li Alloy Systems. J. B. Clark. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131567, Oct. 1957, p. $1.50.

Determination of the habit plane of the Widmanstatten precipitate of the LiZn phase in the cubic Li-Mg solid solution; precipitation of the MgLiZn phase in the cubic Li-Mg solid solution during aging; degree of stabilization attainable through disregistry adjustment by additions of indium to Mg-Li-Al and Mg-Li-Zn alloys.
(N7a; Mg, *Li, Al, Zn, In*)

233-N. Behavior of Hydrogen in Iron (Steel). A. Smialowski. *Neue Hütte*, v. 2, no. 10, 1957, p. 621-626. (Henry Brutcher, Altadena, Calif., Translation no. 4082.)

Previously abstracted from original. See item 130-N, 1958.
(N1c; Fe, *H*)

234-N. Recrystallization Diagram for Molybdenum. E. M. Savitskii. *Doklady Akademii Nauk SSSR*, v. 113, no. 5, 1957, p. 1070-1072. (Henry Brutcher, Altadena, Calif., Translation no. 4086.)

(N5; Mo)

235-N. Inhibition of Diffusion of Hydrogen Into Iron and Steel by Surface Deposits of Certain Metals in Electrolytic Pickling. L. I. Freiman and V. A. Titov. *Zhurnal Fizicheskoi Khimii*, v. 30, no. 4, 1956, p. 882-888. (Henry Brutcher, Altadena, Calif., Translation no. 4089.)

Effect of electrolytic deposits of Pb, Sn, Cu and Ni in various thicknesses on diffusion of hydrogen, catalyzed by a poison, through (Armco) iron and (spring) steel during electrolytic pickling.
(N1, 8-62; *H*, Fe, ST, *Cu, Pb, Sn*)

236-N. Crystal Structure and Nature of Omega Phase in Alloys of Titanium With Chromium. Yu. A. Bagaryatskii. *Doklady Akademii Nauk SSSR*, v. 105, no. 6, 1955, p. 1225-1228. (Henry Brutcher, Altadena, Calif., Translation no. 4103.)

Previously abstracted from original. See item 96-N, 1956.
(N9, M26, Ti, *Cr*)

237-N. Effect of Ultrasonic Vibration on the Structures of Eutectic Alloys. V. V. Zaboleev-Zotov and G. I. Pogodin-Alekseev. *Metallovedenie i Obrabotka Metallov*, no. 1, Jan. 1958, p. 2-6. (Henry Brutcher, Altadena, Calif., Translation no. 4106.)

(N12q, 1-74; Pb, Sb, Zn, Sn)

238-N. Effect of Boron on the Kinetics of Austenite Grain Growth and the Actual Austenite Grain Size. A. M. Tarasov. *Metallovedenie i Obrabotka Metallov*, no. 1, Jan. 1958, p. 17-20. (Henry Brutcher, Altadena, Calif., Translation no. 4118.)

(N3, M27c, 2-60; *B*, ST)

239-N. Solubility and Activity of Oxygen in Liquid Iron, Nickel, Cobalt and Their Mixtures. V. V. Averin, A. Yu. Polyakov and A. M. Samarin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 8, 1957, p. 120-122. (Henry Brutcher, Altadena, Calif., Translation no. 4128.)

Study of activity of oxygen in Fe-Ni-Co system, aimed in part at obtaining data on solubility and activity of oxygen in the pure components of this system. (N16m, P12b, P12e; *O*, Fe, Ni, Co, 14-60)

240-N. Carbides Formed in the Low-Temperature Decomposition of Austenite. V. G. Permyakov. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 24-29. (Henry Brutcher, Altadena, Calif., Translation no. 4163.)

(N8r, 2-63; AY, CN)

241-N. Diffusion of Antimony and Zinc From the Vapor Phase Into Germanium. V. E. Kosenko. *Academy of Sciences of the USSR, Bulletin*, v. 20, no. 12b, 1957, p. 1399-1404. (Columbia Technical Translations.)

4 ref. (N1c; Ge, Sb, Zn)

242-N.* (English.) Studies on the Beta-Epsilon Transformation in Cobalt-Nickel Alloys. Pt. 1. Propagation Process of the Transformation. Sakae Takeuchi and Toshio Honma. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 9, Dec. 1957, p. 492-507.

Metallographic investigation of the propagation of diffusionless transformation of the face-centered cubic structure (beta) into the close-packed hexagonal (epsilon) in Co alloys containing up to 30% Ni. 8 ref. (N6p; Co, *Ni*)

243-N.* (English.) Studies on the Beta-Epsilon Transformation in Cobalt-Nickel Alloys. Pt. 2. Microstructure of Transformation Relief. Sakae Takeuchi and Toshio Honma. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 9, Dec. 1957, p. 508-519.

Mechanism of propagation of beta-epsilon transformation in Co-Ni alloys studied in observation of the microstructure of the relief marking with electron microscope. Each marking consisted of three types of tilts brought about by the motion of three kinds of (A/6) [112] type half dislocations. The markings in specimens transformed by external force consisted of tilts of one direction alone as in plastic slips. 8 ref. (N6p; Co, *Ni*)

244-N.* (English.) Diffusion of Sulfur in Liquid Iron. Pt. 2. Diffusion in Liquid Iron Saturated With Carbon. Yasuji Kawai. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 9, Dec. 1957, p. 520-526.

Measurement of diffusion coefficient of sulphur in liquid iron saturated with carbon by use of radioactive sulphur^{35}. Coefficient was found to be 2.9 to 3.5 x 10^{-5} sq. cm. per sec. for the temperature range 1390 to 1560° C. Activation energy was about 7500 cal. Values of diffusion coefficients are more than those of same concentration in iron-sulphur binary solutions. 9 ref.
(N1b; Fe, *S*)

245-N. (English.) Effect of Si, Cr and Mn on the Equilibrium of Carbon and Oxygen in Molten Iron Saturated With Carbon. Pt. 2. Siro Ban-Ya and Sachio Matoba. *Tohoku University, Technology Reports*, v. 22, no. 1, 1957, p. 97-108.

15 ref.
(N14, P12; Fe, C, O, *Si, Cr, Mn*)

246-N. (French.) Formation of Pro-Eutectoid in Plain Carbon Steels. C. A. Dube, H. I. Aaronson and R. F. Mehl. *Revue de Metallurgie*, v. 55, Mar. 1958, p. 201-210.

Morphology of pro-eutectoid ferrite in plain carbon steels classified into five major types. Effects of isothermal reaction temperature and time, carbon content, austenite grain size and the competitive formation of pearlite upon the development of each of these types. 21 ref. (N8j; CN)

247-N.* (French.) Study of the Diffusion of Sulphur in Steels. A. Kohn. *Revue de Metallurgie*, v. 55, Mar. 1958, p. 265-274.

Specimens in the form of ingots weighing about 250 g. were heat treated in a purified argon atmosphere in the range 900-1300° C. Two of the alloys contained 0.003 and 0.005% S and a third had 0.30% C and 0.28% Mn and about 0.010% S. Results show that some sulphur can dissolve in austenite during annealing and then precipitate at the austenite grain boundaries. 8 ref.
(N1e; ST, *S*)

248-N.* (German.) Recent Research in Steel Transformation. Erich Greulich. *Draht*, v. 9, Apr. 1958, p. 119-131.

Investigation of steel transformation using structural analysis by means of microhardness measurements. Isothermal transformation diagrams for steels with carbon content to 0.18%. Final hardness between pearlite and martensite phases; transformation in low-alloy steels; tempering diagrams.
(N8; ST)

249-N.* (Japanese.) Observation With a High-Temperature Microscope of Austenite Structure of Carbon Steels Containing Different Amounts of Aluminum. Shigeo Hasebe. *Sumitomo Metals*, v. 9, Oct. 1957, p. 207-215.

Heat etching austenite structure was observed at 900, 1000 and 1100° C. Effect on grain growth

showed stratiform structure in sample with smaller amount of Al. With higher amounts of Al, austenite grain growth was slower at 900 and 1000° C., but higher at 1100° C. Inhibition of grain growth by nonmetallic inclusions was observed in one sample. Heat etching grain was smaller. A thin ferrite band at the heat etching surface of 0.6% carbon steel after slow cooling and precipitation of small globular carbide at the crystalline interface of 18-8 steel was observed, suggesting that heat etching free surface has the characteristics of grain-boundary surface. Oxidation at the surface of heat etching structure will inhibit austenitic grain growth, as will also the grain-boundary character of heat etching surface. 5 ref. (N8, N3, 2-60; AY, *Al*)

250-N. (Rumanian.) **Kinetics of the Pre-Precipitation Phenomenon in an Alloy of the Duraluminum Type.** M. Protopopescu. *Studii si Cercetari de Metalurgie*, v. 2, no. 3, 1957, p. 221-240.

15 ref. (N7b; Al-b)

251-N. (Rumanian.) **Some Problems of the Kinetics of the Isothermal Transformations of a Nodular Graphite Casting in the Solid State. Graphitization, Formation of the Austenite and Decomposition of the Pearlite.** D. Raseev. *Studii si Cercetari de Metalurgie*, v. 2, no. 3, 1957, p. 241-264.

12 ref. (N8g; CI-r)

252-N. (Spanish.) **Transformation Mechanism in Heat Affected Zone in Welding of Steel.** Felipe A. Calvo Calvo. *Ciencia y Tecnica de la Soldadura*, v. 8, Jan-Feb. 1958, 16 p.

High-temperature effects in welding of steel; thermal cycle and structural changes; micrographs of metallurgical transformations; hardness and microscopic test at fusion zone. (N8; K9n; ST, 7-51)

253-N. Inert Gas Atoms in Metals. D. E. Rimmer and A. H. Cottrell. *Philosophical Magazine*, v. 2, Nov. 1957, p. 1345-1353.

21 ref. (N15d)

254-N. (German.) **Age Hardening of Titanium Alloys. Age Hardening and Recovery of Titanium-Vanadium Alloys.** W. Knorr. *Technische Mitteilungen Krupp*, v. 15, Dec. 1957, p. 178-193.

24 ref. (N7a; Ti-b, *V*)

255-N.* (Italian.) **Influence of Manganese on the Structural Characteristics of Extruded Sections in AC 11 Alloy.** E. Di Russo and D. Gualandi. *Alluminio*, v. 27, Feb. 1958, p. 55-61.

Influence of Mn content up to 0.65%. Critical cold working increases with increase in Mn content; macrostructure is improved by reduction of recrystallized zone; more uniform mechanical properties are obtained at all points of extruded elements. 5 ref. (N5, M28, Q-general; Al-f, *Mn*, 4-58)

256-N. (Russian.) **Determination of Speed of Diffusion of Hydrogen in Metals.** R. A. Ryabov and P. V. Rel'd. *Zavodskaya Laboratoriya*, v. 24, Mar. 1958, p. 306-308.

Method for studying hydrogen diffusion through metallic membrane at high temperature. 8 ref. (N1a; *H*)

257-N.* Spiral Growth During Vapor Deposition of Cadmium. W. I. Pollock and R. F. Mehl. *American Society for Metals, Transactions*, Preprint no. 80, v. 51, 1957, 34 p.

Macroscopic spiral growth of Cd upon the basal hexagonal planes of Cd studied during actual deposition from Cd vapor. These spirals, visible at 75X and having heights between 300 and 2000 Å, originated at ridge boundaries of crystals grown on substrates formed by melting and then freezing deposits of Cd which had been previously sublimed from the vapor phase. 12 ref. (N15g, N12n; Cd)

258-N.* Crystal Growth of Silver Metal, Mechanism and Kinetics. Welby G. Courtney. *Journal of Chemical Physics*, v. 27, Dec. 1957, p. 1349-1356.

The crystal growth of silver metal whiskers and "ferns" occurring in the reduction of Ag(I) with Fe(II) from aqueous perchlorate solution was directly observed under the microscope. Whiskers frequently grew at well-defined angles to the previous direction and occasionally stopped growing abruptly although nearby whiskers continued to grow. In fern growth, short spikes grew in a regular manner from only one side of a parallel-sided main stem. (N3r; Ag)

259-N.* Adsorption and Diffusion of Oxygen on Tungsten. Robert Gomer and J. K. Hulm. *Journal of Chemical Physics*, v. 27, Dec. 1957, p. 1363-1376.

Surface diffusion and adsorption of oxygen on tungsten studied by a field emission technique; 80% of the chemisorbed layer can be formed without appreciable activation at 27° K. The layer is stable up to 700° K., where desorption and oxidation start. The latter is markedly dependent on the amount of oxygen on the surface. At 300° K., there is a slow oxygen uptake probably associated with incipient oxidation. (N1a, P13d, W, *O*)

260-N. Investigation of a Shock-Induced Transition in Bismuth. Russel E. Duff and F. Stanley Minshall. *Physical Review*, v. 108, Dec. 1, 1957, p. 1207-1212.

Structure of the shock-wave system to be expected in a material which can undergo a polymorphic transition. The slope of the coexistence line in the p-T plane for the transition can be determined from shock-wave measurements at a given initial temperature. Shock waves produced by high explosives were used to investigate the equation of state of bismuth. (N11h; Bi)

261-N.* Effect of Liquid Media on the Grey Tin ⇌ White Tin Transformation in Commercially Pure Tin. R. W. Smith and G. V. Raynor. *Physical Society Proceedings*, v. 70B, Dec. 1, 1957, p. 1135-1142.

Dilatometric experiments using xylene, ethyl alcohol, alcoholic "pink salt" solution and distilled water show that the rates of transformation of the alpha→beta and beta→alpha reactions in Sn are affected by the surrounding medium. The alpha→beta rate for material which has undergone one previous beta→alpha change is greater in water or ethyl alcohol than in xylene. All rates increase with temperature up to the highest investigated (29-86° C.), and do not reach a maximum at about 25° C. as reported by earlier workers. (N6p; Sn)

262-N. Recrystallization of Low-Carbon Steel During Rapid Induction Heating. B. A. Kuznetsov. *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1958, p. 28-35. (Henry Brutcher, Altadena, Calif., Translation no. 4150.)

Study of recrystallization of nonferrous alloys by metallographic and X-ray methods shows that grain size is largely determined by speed of heating. (N5, 2-61; CN-g)

263-N.* (English.) **Production of Oriented Germanium Crystals by the Contact Method.** E. Rubes. *Soviet Physics—Technical Physics*, v. 2, no. 8, (1957), p. 1538-1543.

An application of Czochralski's method has been developed for producing single crystals and bicrystals of Ge, using a Ge contact, from which crystallization commenced. These crystals are oriented spontaneously in accordance with the temperature field of the apparatus, and are distinguished by well-developed crystal faces. 4 ref. (N3r, M26n; Ge)

264-N.* (German.) **Transformation Properties of Steel With 12 to 14% Cr.** Walter Peter and Werner Matz. *Archiv für das Eisenhüttenwesen*, v. 28, Dec. 1957, p. 807-823.

The transformation properties of steel with 0.07 up to 2.07% C and 12 to 14% Cr are observed metallographically, dilatometrically, through measurements of magnetic saturation, hardness and through X-ray examinations. T-T-T diagrams were obtained in all phases and the austenitization temperature and the influence of carbon contents were investigated. 16 ref. (N8; SS)

265-N.* (German.) **Influence of Grain Transformation Upon Grain Size and Structure of Ferrite and Austenite of a Carbon Steel of 0.15% C.** Heinz Borchers and Gunther Boxhorn. *Archiv für das Eisenhüttenwesen*, v. 29, Jan. 1958, p. 47-56.

Structure transformation during heating between Ac_1 and Ac_3 compared to the structure after repeated hot etching between Ac_1 and Ac_3 and above Ac_3. Repeated grain transformations with slight austenitization resulted in a characteristic small grain size independent of the cooling velocity. Melting at temperatures above Ac_3 suppressed the influence of previous transformations. Heating velocity had no significant influence. 26 ref. (N8, M27c; CN)

266-N.* (German.) **Contribution to the Development of the System Iron (II)-Oxide, Iron (II) Sulphide, Manganese (II) Oxide and Manganese (II) Sulphide.** Klaus Giessler and Ernst Justus Kohlmeyer. *Archiv für das Eisenhüttenwesen*, v. 29, Jan. 1958, p. 57-63.

The equilibrium conditions of the four-component system iron (II) oxide-iron (II) sulphide, manganese (II) oxide and manganese (II) sulphide, and of the corresponding two- and three-component systems are determined by melting in sintered clay crucibles in the Tammann furnace and by thermomagnetic as well as microscopic investigations. The process of solidification and the ensuing reciprocal processes between the oxides and sulphides of Fe and Mn are described especially in the bordering zones between the three-component and the four-component systems. (N12, P12; Fe, 14-68)

267-N. (German.) **On the Quench Aging Process of Conventional Structural Steels in the Range of Climatic Temperatures.** Friedrich-Carl Althof and Dieter Bohm. *Neue Hütte*, v. 3, Feb. 1958, p. 101-109.

Age hardening of commercial structural steel was observed over a period up to 400 days at various

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

temperatures. Quenching from 720° C. and aging at 18° C. over this period resulted in greatest hardness. Tests were carried out on rimming and killed openhearth steels with manganese contents between 0.31 and 0.58%. 17 ref.
(N7a, Q25, 2-61; ST)

268-N.* (German.) **On a Seam-Type Eutectoid in the Transformation Structure of Low and Medium-Alloy Heat Resistant Steels.** Richard Pusch and Hans-Jurgen Schuller. *Archiv für das Eisenhüttenwesen,* v. 29, Jan. 1958, p. 65-72.

Investigations on steel with 2 to 2.5% Cr and 1.0% Mo and a steel with 0.13% C, 0.4% Cr, 0.85% Mo and 0.35% V. T-T-T diagrams for continuous cooling obtained by dilatometer measurements, and light and electron microscope observations. The seam-type structures along the ferrite boundaries were of carbidic character and consisted of eutectoid mixture of ferrite and string or band-type carbides. 4 ref. (N8; AY, SGA-h)

269-N.* (German.) **Acoustical Phenomena During Phase Transformation in the System Lead-Tin.** Heinz Borchers and Joseph Kaiser. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 95-101.

Apparatus was developed to measure amount, intensity and frequency of noise. Phase diagram can be developed through study of noises along the liquidus, solidus, eutectic and solid solution lines. Noise during solidification occurs only in metals which contract during solidification, such as Pb and Sn, while noise in the melting process occurs only in metals which contract during melting. 9 ref. (N12, M24b; Pb-Sn)

270-N.* (Polish.) **Mechanism of Sulphurization of Copper-Zinc Alloys.** Lucjan Czerski, Stanislaw Mrowec and Teodor Werber. *Archiwum Hutnictwa,* v. 2, 1957, p. 391-410.

Kinetics of sulphurization scaling and diffusion, in alloys with 1 to 20% Zn. With increasing Zn, the rate of sulphurization decreases. 20 ref. (N1; Cu-b, *Zn, S*)

271-N.* (Portuguese.) **Austenite Transformation: Semi-Stable Lines in the Fe-C Equilibrium Diagram.** Michiyasu Doi. *ABM, Boletim da Associacao Brasileira de Metais,* v. 14, Jan. 1958, p. 95-110.

Semistable lines in the Fe-C equilibrium diagram were calculated from free energies of austenite, ferrite and cementite. 9 ref.
(N8, M24b, P12a; ST)

272-N.* (Portuguese.) **Austenite Transformation: Mechanism of Formation of Pearlite and Bainite.** Michiyasu Doi and Kenkichi Fujimori. *ABM, Boletim da Associacao Brasileira de Metais,* v. 14, Jan. 1958, p. 111-138.

On basis of semistable Fe-C equilibrium diagram, a theory of formation of pearlite and bainite in carbon steels is proposed. Formation of pearlite takes place with simultaneous diffusion of atoms of iron and carbon, and can occur only at high temperatures where mobility of iron atoms is high. Upper bainite would be formed by process similar to formation of pro-eutectoid ferrite; lower bainite would result from mechanism similar to that of martensite transformation. Difference between kinetics of formation of upper and lower bainites can be attributed principally to variations of mobility of carbon atoms with variations in transformation temperatures. 33 ref.
(N8h, N8m; ST)

Physical Properties

210-P.* **Graphite as a High Temperature Material.** John E. Hove. *AIME Transactions,* v. 212, Feb. 1958, p. 7-13.

High-temperature physical properties of graphite interpreted in the light of present-day knowledge of the mechanisms affecting these properties. 22 ref.
(P-general, 2-62; NM-k36)

211-P. Electric Conductivity as Nondestructive Testing Method for Structural Changes in Surface Layers. A. Keil. *AIME Transactions,* v. 212, Feb. 1958, p. 63-64.

Experiments with Ag alloys containing 8% Cd with Ag-Cu alloys show that decomposition of the homogeneous solid solution by internal oxidation may have differing effects on conductivity. Eddy-current measurements are a convenient aid in measuring the structural differences between homogeneous alloys and the state reached by the thermal treatment. 8 ref.
(P15g, 1-54, N-general, Ag-b, *Cu*)

212-P. On the Solubility of Iron in Magnesium. K. Anderko, A. S. Yamamoto and W. Rostoker. *AIME Transactions,* v. 212, Feb. 1958, p. 85.
(P12, Mg, *Fe*)

213-P.* **Solubility of Nitrogen in Liquid Iron and Iron Alloys.** Vikosh C. Kashyap and Norman Parlee. *AIME Transactions,* v. 212, Feb. 1958, p. 86-91.

Solubilities of nitrogen in liquid iron and liquid Fe-Ni, Fe-Mo, Fe-V and Fe-Mo-V alloys were measured by the Sieverts method. Measurements were made at 1600 to 1800° C. on binary alloys up to 20% Ni, 10% V, 10% Mo; and on ternary alloys containing 0 to 3% V with 0 to 5% Mo. Results confirm that Sieverts' law is obeyed in the range 50 to 750 mm. pressure. 19 ref.
(P12e, *N*, Fe)

214-P. Activity Measurement in the System Iron-Chromium. C. L. McCabe, R. G. Hudson and H. W. Paxton. *AIME Transactions,* v. 212, Feb. 1958, p. 102-105.

Vapor pressures of pure Fe and pure Cr measured by the Langmuir and Knudsen methods agree within experimental error at 1200° C. Knudsen cell experiments show that Cr and Fe show thermodynamic behavior close to ideal at 1205 and 1250° C. in the system Fe-Cr. 12 ref. (P12; Fe, Cr)

215-P.* **The Vapor Pressure of Palladium.** J. F. Haefling and A. H. Daane. *AIME Transactions,* v. 212, Feb. 1958, p. 115-116.

Vapor pressure of Pd was found to be higher than the estimated values in literature by a factor of about 15. Results indicate an abnormally weak binding in the case of Pd which is consistent with the lower value of the heat of vaporization found. 13 ref. (P12c; Pd)

216-P.* **Thermodynamic Study of Liquid Pb-Zn Solutions.** F. D. Rosenthal, G. J. Mills and F. J. Dunkerley. *AIME Transactions,* v. 212, Apr. 1958, p. 153-161.

Activities, free energies and heats and entropies of mixing of liquid Pb-Zn alloys obtained by the electrode-potential method between 400 and 650° C. A vapor-pressure method was used to extend the activity measurements to 900° C., allowing the maximum of the immiscibility gap to be estimated by thermodynamic calculation. Data on the monotectic and eutectic points. 18 ref. (P12; Pb, Zn)

217-P.* **Studies on the Metallurgy of Silicon-Iron. Pt. 1. Silicon Nitrides. Pt. 2. Anomaly in the Alpha Solid Solution.** Alan U. Seybolt. *AIME Transactions,* v. 212, Apr. 1958, p. 161-167.

Pressure-temperature relations required to maintain the existence of Si_3N_4 in Si-Fe of 0.44-11.7% Si partially explored. Calculation of some thermodynamic quantities; evidence of an order-disorder two-phase field extending at 800° C. from about 1 to 5.5% Si. 16 ref.
(P12, N10; Si, Fe)

218-P. Solubility and Activity of Titanium in Carbon-Saturated Iron. F. D. Delve. *AIME Transactions,* v. 212, Apr. 1958, p. 183-185.
(P12e, P12b; Fe, *C, Ti*)

219-P. Reduction of Magnetic Susceptibility in Beryllium-Copper. Harold Bernstein. *AIME Transactions,* v. 212, Apr. 1958, p. 225-226.

Presence of iron impurity causes variations in magnetic properties. Effect of small amounts of iron on susceptibility. (P16, 1-60; *Be,* Cu)

220-P. Magnetic Properties and the Structure of Metals. W. Sucksmith. *British Journal of Applied Physics,* Supp. 6, 1957, p. S24-S27.

Use of magnetic properties to detect variations in structure and properties of magnetic materials. Newer developments in magnetism and their application. 9 ref.
(P16, S13h; SGA-n)

221-P. Heat Transfer Through Coated Metal Surfaces. Robert L. Lee. *Corrosion,* v. 14, Apr. 1958, p. 187t-188t.

Application of 4-mil phenolic and 15-mil vinyl coatings on steel in heat exchangers decreased corrosion and gave higher heat transfer rates than ultimately experienced with corroded uncoated metal surfaces.
(P11k, W13b, 8-70)

222-P.* **Note on the Influence of Sodium on Magnesium-Lithium Alloys.** R. J. M. Payne and J. D. L. Eynon. *Institute of Metals, Journal,* v. 86, Apr. 1958, p. 351-352.

Solubility of sodium in Mg-Li alloys varies with temperature. Alloys containing Na may become embrittled on standing at ordinary temperatures or during certain heat treatments. Tolerance for Na depends on grain size; for a cast binary 12% Li alloy it is in the region of 0.002%. 8 ref.
(P12e, Q26s, 2-60; Mg-b, *Li, Na*)

223-P.* **Some Investigations on Plutonium Metal.** E. Dempsey and A. E. Kay. *Institute of Metals, Journal,* v. 86, Apr. 1958, p. 379-384.

An adiabatic method for measuring specific heat of Pu which makes use of the self-heating of the metal to raise the temperature of the specimen. Results for the alpha phase above room temperature, including an estimate of the alpha→beta heat of transformation. Preliminary experiments on the oxidation of Pu in air. 16 ref.
(P12q, P12r; Pu)

224-P.* **The Determination of the Solubilities of Beryllium and Molybdenum in Liquid Bismuth.** G. W. Horsley and J. T. Maskrey. *Insti-*

tute of Metals, Journal, v. 86, Apr. 1958, p. 401-402.

Solubility of Be in Bi determined in the range 700-1000° C.; equation for its variation with temperature. Solubility of Mo in Bi is below the limits of analytical detection (1 ppm.) up to 1030° C.
(P12e; Be, Bi, Mo)

225-P. Heat Capacity of Sodium Tungsten Bronzes From 1.8 to 4.2° K. R. W. Vest, M. Griffel and J. F. Smith. *Journal of Chemical Physics,* v. 28, Feb. 1958, p. 293-296.

19 ref. (P12r, 1-63; Cu-s, *Na, W*)

226-P. Effect of Plastic Deformation on the Electrical Resistivity of Chromium. *Nature,* v. 181, Feb. 15, 1958, p. 477-478.

10 ref. (P15g, 3-68; Cr)

227-P. Magnetoresistance Coefficients and Their Temperature Dependence in Iron and Silicon Steel. Eiji Tatsumoto. *Physical Review,* v. 109, Feb. 1, 1958, p. 658-662.

6 ref. (P16, 2-61; Fe, AY, *Si*)

228-P. Radiation Damage Experiments and the Nature of Thermal Spikes in III-V Compounds. Ulrich Gonser and Boudewyn Okkerse. *Physical Review,* v. 109, Feb. 1, 1958, p. 663-667.

Results of resistivity measurements on gallium-antimony alloys during irradiation and of X-ray observations after irradiation suggest strongly that thermal spikes are introduced. 16 ref.
(P15, 2-67; Ga, Sb)

229-P. Paramagnetic Effect in Superconductors. Pt. 5. Resistance Transition of Tin Wires. Hans Meissner. *Physical Review,* v. 109, Feb. 1, 1958, p. 668-680.

35 ref. (P15g, P16p; Sn, 4-61)

230-P. Paramagnetic Effect in Superconductors. Pt. 6. Resistance Transitions in Indium Wires. Hans Meissner and Richard Zdanis. *Physical Review,* v. 109, Feb. 1, 1958, p. 681-685.

6 ref. (P15g, P16p; In, 4-61)

231-P. Heat Capacity in the Normal and Superconducting States and Critical Field of Niobium. Chien Chou, David White and H. L. Johnston. *Physical Review,* v. 109, Feb. 1, 1958, p. 788-796.

23 ref. (P12r, P15g; Cb)

232-P. Heat Capacity in the Normal and Superconducting States and Critical Field of Tantalum. David White, Chien Chou and H. L. Johnston. *Physical Review,* v. 109, Feb. 1, 1958, p. 797-802.

10 ref. (P12r, P15g; Ta)

233-P. The Superconductive Critical Temperature and the Electronic Specific Heat of Impure Tin. E. A. Lynton, B. Serin and M. Zucker. *Physics and Chemistry of Solids,* v. 3, no. 3/4, 1957, p. 165-174.

Measurements of the threshold magnetic field as a function of temperature for specimens of tin containing 0.04 to 2.0 at. % of various impurities gave the superconductive critical temperature as well as the temperature coefficient of the electronic specific heat of the normal phase. 24 ref. (P15g; P12r; Sn)

234-P. Effect of Alloying on the Superconducting Transition Temperature of Tin. A. B. Pippard. *Physics and Chemistry of Solids,* v. 3, no. 3/4, 1957, p. 175-177.

A semi-classical treatment of electron-phonon interaction suggests that the interaction is reduced if the electrons are appreciably scattered by impurities, the reduction being expressible in terms of the ratio of phonon wavelength to electronic free path. 4 ref. (P15g, 3-69; Sn)

235-P. Low Temperature Electrical and Magnetic Behavior of Dilute Alloys of Mn in Cu. R. W. Schmitt and I. S. Jacobs. *Physics and Chemistry of Solids,* v. 3, no. 3/4, 1957, p. 324-337.

30 ref. (P15, P16, 2-63; Cu, *Mn*)

236-P.* Hall Effect and Electrical Conductivity of Transition-Metal Diborides. H. J. Juretschke and R. Steinitz. *Physics and Chemistry of Solids,* v. 4, no. 1/2, 1958, p. 118-127.

The room-temperature resistivity and Hall constant of the diborides of the fourth to sixth-column transition metals and their solid solutions have been measured to clarify the electronic structure of these compounds. 15 ref. (P15g; 14-68, B)

237-P. Thermodynamics and Magnetic Structures of the Allotropic Modifications of Manganese. R. J. Weiss and K. J. Tauer. *Physics and Chemistry of Solids,* v. 4, no. 1/2, 1958, p. 135-143.

15 ref. (P12, P16, N6p; Mn)

238-P. Superconductivity in the Ni-Pd-As System. B. T. Matthias and S. Geller. *Physics and Chemistry of Solids,* v. 4, no. 1/2, 1958, p. 156-157.

6 ref. (P15g; Ni, Pd, As)

239-P. Determination of Cold-Work Energy in Copper by Means of Electrochemical Potential Measurements. Asher Peres. *Research Council of Israel, Bulletin,* v. 6c, Nov. 1, 1957, p. 9-12.

5 ref. (P12, Q24, P15g; 1-53)

240-P. Superconducting Transitions in Tin Whiskers. *Tech Engineering News,* v. 39, Jan. 1958, p. 40-42.

(P15; Sn, 14-61)

241-P. Irreversible Changes in Length of Zinc Under Thermal Stress. K. Claus and K. Lohberg. *United Kingdom Atomic Energy Authority,* IGRL-T/C-43, 1957, 17 p.

Changes of length with segregation processes; analysis of length changes with annealing of high-grade Zn; length changes due to thermal cycling; explanation due to anisotropy of the Zn crystal; length changes with recrystallization and grain growth; associated changes in the thermal expansion coefficient, the elastic modulus and the texture. 9 ref. (P10d, P11g; Zn)

242-P.* Properties and Applications of Commercial Molybdenum and Molybdenum Alloys. R. R. Freeman. Paper from "The Metal Molybdenum", American Society for Metals, p. 10-30.

Physical, chemical, mechanical properties; transition temperatures; creep-rupture properties; commercial availability; fabricating methods. Fields of future application include the glass industry, metalworking, chemical and nuclear energy (for heat exchangers), aircraft and missiles, high-temperature engines. 9 ref.
(P-general, Q-general, 17-57; Mo)

243-P. Electric Properties of Some Compounds of Elements in the Third and Fifth Groups of the Periodic Table (InAs and InSb). D. N. Nasledov and A. Iu. Khalilov. *Academy of Sciences of the USSR, Bulletin,* v. 20, no. 12, 1956, p. 1370-1371. (Columbia Technical Translations, Inc.)

The temperature dependence of the conductivity of samples with p and n-type conductivity was determined in the range from 1.3° K. The Hall coefficent in the region of the transition from intrinsic conductivity changes sign as the magnetic field intensity is increased, which is in agreement with Madelung's theory. An anomalous increase in the carrier mobility with heating of the sample was observed in indium arsenide at high temperatures. (P15; In, Sb, As)

244-P. Structure and Electrical Properties of Indium Antimonide in Thin Layers. I. D. Konozenko and S. D. Mikhnovskii. *Academy of the USSR, Bulletin,* v. 20, no. 12, 1957, p. 1363-1367. (Columbia Technical Translations, Inc.)

Properties and possible uses of intermetallic compounds. 10 ref.
(P15, M26q; In, Sb)

245-P. Semiconductor Properties of Magnesium-Bismuth Alloys. A. K. Kikoin and G. D. Fedorov. *Academy of Sciences of the USSR, Bulletin,* v. 20, no. 12b, 1957, p. 1377-1383. (Columbia Technical Translations, Inc.)

Investigation of the Mg-Bi system shows that these alloys, in the vicinity of the stoichiometric Mg_3Bi_2 composition, are extrinsic semiconductors. The compound Mg_3Bi_2 itself has attributes of dielectrics. 14 ref. (P15, M24b; Bi, Mg)

246-P. Electrical Properties of Manganese-Germanium Alloys. I. G. Fakidov, N. P. Grazhdankina and V. N. Novogrudskii. *Academy of Sciences of the USSR, Bulletin,* v. 20, no. 12b, 1957, p. 1384-1391. (Columbia Technical Translations, Inc.)

Investigation of conditions under which ferromagnetism and antiferromagnetism develop. The Mn-Ge system comprises three ferromagnetic phases, corresponding to the compounds Mn_5Ge_2, Mn_5Ge_3 and Mn_3Ge_2. 8 ref.
(P15, P16, M24b, Ge, Mn)

247-P.* (French.) **Curie Points of Solid Solutions of Ni-Cu-Au.** V. Marian, I. Maxim, I. Ursu and V. Cristea. *Revue de Physique,* v. 2, no. 1, 1957, p. 106-108.

Nine specimens of different alloy concentrations were heat treated in vacuum in small quartz flask for 12 hr. at 1000 °C. before quenching. Results of measurements of Curie points and solid solution limits permit conclusion that Hume-Rothery iso-electronic law is satisfied, even in case of Ni-Cu-Au alloys.
(P16d, N12p; Ni, Cu, Au)

248-P. (German.) **Conductivity and Hall's Constant. Pt. 9. Method of Separate Determination of Density and Mobility of Charge Carriers With Various Charges.** Hans-Eberhard Schmidt. *Zeitschrift für Metallkunde,* v. 49, Mar. 1958, p. 113-123.

Method using estimation of thermo-electric power and Ettinghausen-Nernst coefficient.
(P15g, 1-54; Cu, Ni, Au, Ag, Cr)

249-P.* (German.) **Investigation on Electrical Conductivity of Gold-Manganese Alloys.** Heinz Eicke. *Zeitschrift für Metallkunde,* v. 49, Mar. 1958, p. 157-161.

Conductivity of Au-Mn alloys with various Mn concentrations at temperatures between −200 and 800° C. Occurrence of intermetallic phases in quenched and tempered alloys. Temperature coefficients of resistance in range 0-100° C.
(P15g, 2-61; Au, Mn)

250-P. (Rumanian.) **Contribution to the Experimental Study of the Viscosity of the Basic Openhearth Slags. Pt. 1. Laboratory Study of the Viscosity and Conductivity of the Basic Slags.** I. Tripsa. *Studii si Cercetari*

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

de Metalurgie, v. 2, no. 3, 1957, p. 289-310.

15 ref. (P10f, D11n; RM-q)

251-P. (Rumanian.) **Some Theoretical Problems of the Structure and Mechanical Properties of Metals.** T. Dulamita. *Studii si Cercetari de Metalurgie,* v. 2, no. 3, 1957, p. 375-382.

Dependence of the electrical and mechanical properties of metals on the conditions of plastic deformation and heat treatment. Analogical considerations are adduced in the mathematical analysis of these two types of properties.
(P15, Q-general, 2-64, 3-68)

252-P. Design Characteristics of Magnetic Steel Castings. W. C. Pierce. *Mechanical Engineering,* v. 80, Apr. 1958, p. 64-66.

Design and operation of magnetic clutches and brakes; induction and coercive force in magnetic devices. Use of dynamo steel, silicon and ferrocobalt; production of dynamo steel with 0.07 to 0.08% C. for improved magnetic parts.
(P16, E-general, AY, 5-60, 17-51)

253-P.* (French.) **Adsorption and Overvoltage.** Maurice Bonnemay and Gerard Lapluge. *Centre National de la Recherches Scientifique, Journal des Recherches,* no. 39, June 1957, p. 119-124.

Adsorption in liquid phase; study of curves of polarization of platinum in relation to hydrogen.
(P13d, P15; Pt, *H*)

254-P.* (German.) **Contribution of the Binding Metals of Hard Metal Alloys to Surface Tension.** H. J. Booss. *Planseeberichte für Pulvermetallurgie,* v. 6, Apr. 1958, p. 17-21.

Wettability is one of the important properties of the iron group that determine their application to hard metal technology. The surface tension of the binding metals for hard alloys was determined under conditions that approximate those of production techniques. Additives of tungsten carbide lower the surface tension of cobalt. 23 ref.
(P13h; Co, Fe, Ni, 6-69)

255-P. (German.) **Solubility of Tungsten Carbide in Titanium Carbide.** J. Hinnuber and W. Kinna. *Technische Mitteilungen Krupp,* v. 15, no. 7, Dec. 1957, p. 155-160.

15 ref. (P12e; W, Ti, 6-69)

256-P. (German.) **Investigation of Anomalous Temperature Dependence of Initial Permeability and Magnetic After-Effect of Iron and Iron-Silicon Alloys for Temperatures Between 300 and 700° C.** H. Zahlenbrach and G. Sommerkorn. *Technische Mitteilungen Krupp,* v. 15, Dec. 1957, p. 161-164.

4 ref. (P16; Fe)

257-P. (Russian.) **Micro-Amperometric Method for Investigation of Electric Conductivity of Aluminum Oxide Coating in Moist Atmosphere.** E. I. Kmito and A. A. Kmito. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 303-306.
(P15g, 1-53; Al, 14-68)

258-P. (Russian.) **Measurement of Magnetic Susceptibility of Liquid Metals by Physico-Chemical Analysis.** A. A. Vertman and A. M. Samarin. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 309-310.

7 ref. (P16; 14-60)

259-P. (English.) **Static Electrode Potential Behavior of Tantalum and Its Behavior on Anodic Polarization.** E. M. Khairy and M. Kamal Hussein. *Chemical Society of Japan, Bulletin,* v. 30, Dec. 1957, p. 944-949.
(P15m; Ta)

260-P. Heat Capacity of Calcium From 1.8 to 4.2° K. Maurice Griffel, R. W. Vest and J. F. Smith. *Journal of Chemical Physics,* v. 27, Dec. 1957, p. 1267-1269.
(P12r; Ca)

261-P. Transverse Magnetoresistance Effect in Indium Antimonide. C. H. Champness. *Journal of Electronics and Control,* v. 4, Mar. 1958, p. 201-218.

12 ref. (P15g, P16; In, Sb)

262-P. Electrical and Thermal Properties of Bi_2Te_3. C. B. Satterthwaite and R. W. Ure, Jr. *Physical Review,* v. 108, Dec. 1, 1957, p. 1164-1170.

(P11, P15; Bi, Te)

263-P. Magnetic Properties of UMn_2. S. T. Lin and A. R. Kaufmann. *Physical Review,* v. 108, Dec. 1, 1957, p. 1171-1174.

16 ref. (P16d; U, Mn)

264-P. Magnetoresistance of Single Crystals of Copper. Roy Olson and Sergio Rodriquez. *Physical Review,* v. 108, Dec. 1, 1957, p. 1212-1218.

(P15g, P16g; Cu, Ag, Au, 14-61)

265-P. Influence of Technological Factors on Electromagnetic Properties of Cold-Reduced Transformer Steel. M. M. Ioffe, A. G. Petrenko and G. F. Chub. *Stal',* no. 10, 1957, p. 936-940. (Iron and Steel Institute Translation no. 897.)

Previously abstracted from original. See item 98-P, 1958.
(P16, 2-60, 1-73; ST, SGA-r)

266-P. (English.) **Magneto-Resistance at Low Temperatures and the Mean Free Path in Metals.** D. K. C. MacDonald. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 15-21.

(P15g; P16)

267-P. (English.) **Electrical Resistance and the Purity of Metals.** G. J. van den Berg. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 31-35.

28 ref. (P15g, 3-69)

268-P. (French.) **Influence of Crystallization of Aluminum on Electrical Conductivity at Low Temperatures.** Ph. Albert. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 40-49.

Study of zone-refined Al by conductivity tests at low temperatures.
5 ref. (P15g, M27a, 2-63; Al-a)

269-P. (French.) **Measuring Low-Temperature Conductivity of High-Purity Aluminum.** M. Caron. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 51-62.

(P15g, 1-67; Al-a)

270-P. (French.) **Measurements on Magnetic Susceptibility of Germanium.** W. Duchateau and A. Van Itterbeek. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 83-89.

(P16p, 1-54; Ge)

271-P. (French.) **Thermal Conduction and Heat Capacity of Dilute Silver Alloys at Low Temperatures.** J. DeNobel. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 97-109.

27 ref. (P11b, P12r, 2-63; Ag-b)

272-P. (French.) **On the Resistivity of Some Cu-Sb Alloys.** Ordan Pecijare and Sylvain Janssen. *Comptes Rendus,* v. 246, Mar. 10, 1958, p. 1516-1517.

(P15g; Sb, Cu)

273-P.* (French.) **Measurement of the Gyromagnetic Ratio of a Very Pure Nickel.** Andre J. P. Meyer. *Comptes Rendus,* v. 246, Mar. 10, 1958, p. 1517-1519.

Specimen of JM nickel was annealed 4 hr. at 1000° C. in hydrogen atmosphere. Measurements of gyromagnetic ratio were then made on basis of Einstein-de Haas effect.
(P16; Ni-a)

274-P.* (French.) **An Anomaly in the Electrical Resistivity of Cd-Sn Alloys.** Ordan Pecijare and Sylvain Janssen. *Comptes Rendus,* Mar. 17, 1958, p. 1674-1678.

Study of resistivity as influenced by composition revealed peculiarity in domain of weak concentrations of Cd. According to accepted phase diagrams, regular variation of resistivity with concentration of Cd up to 2% in weight (alpha phase only) would be expected. Measurements showed minimum of resistivity for concentration of 1.3% Cd by weight; above this point resistivity again increases with concentrations up to 5% Cd; thenceforth it varies regularly in proportion to composition. (P15g; Sn, *Cd*)

275-P.* (German.) **Influence of Various Heat Treatments Upon the Work Hardening Properties and the Specific Electric Resistance of Soft, Rimming Basic Bessemer Steel and Carburized Pure Iron During Cold Working and During Aging Through Quenching or Deformation.** Hermann Schenck, Engen Schmidtmann and Helmut Brandis. *Archiv für das Eisenhüttenwesen,* v. 28, Dec. 1957, p. 761-769.

Three types of specimens examined: (1) from outside of a bar with 0.02% C, 0.01% Si, 0.25% Mn, 0.029% P, 0.012% S, 0.0054% N; (2) from the center of the same bar with 0.05% C, 0.01% S, 0.26% Mn, 0.05% P, 0.03%S and 0.0084% N; (3) carburized pure iron with 0.009% C. 17 ref.
(P15g, 2-64, Q23a; ST-g, Fe-a)

276-P.* (German.) **Investigations on the Equilibrium Points of the Systems Zirconium Oxide, Calcium Oxide and Various Iron Oxides.** Wilhelm Fischer, Anton Hoffmann and Alfred Hoffman. *Archiv für das Eisenhüttenwesen,* v. 28, Dec. 1957, p. 771-776.

Solubility of iron oxides in the various phases of calcium oxide, and zirconium oxide. Previous results in the two-component system of calcium oxide and zirconium oxide at 1450° C. are verified. An isothermic cross section of the system zirconium oxide, calcium oxide and iron (111) oxide at 1450° is developed. 17 ref. (P12e; Zr, Ca, Fe, 14-68)

277-P. (German.) **Electric Conductivity and Hall Constant. Pt. 8.** Werner Koster and Hans-Eberhard Schmidt. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 87-90.

(P15, Ag, Zn)

278-P.* (Polish.) **Thermodynamic Properties of Liquid Metallic Solutions. Pt. 1. The Ag-Pb System.** Janusz Terpilowski. *Archiwum Hutnictwa,* v. 2, 1957, p. 289-304.

Fourteen liquid Ag-Pb alloys with 5 to 92.5 at. % Pb investigated electrochemically by measuring the electromotive forces in reversible voltaic cells. 29 ref. (P12; Ag, Pb)

279-P. (Polish.) **Methods and Measurement of the Heat Conductivity Coefficient for Graphite and Other Carbon Materials at Temperatures up to 2000° C.** Tadeusz Senkara. *Archiwum Hutnictwa,* v. 2, 1957, p. 305-324.

25 ref. (P11h, P12; NM-k36)

280-P. (Pamphlet.) **Thermal Properties of Thirteen Metals.** C. F. Lucks and H. W. Deem. *American Society for Testing Materials, Special Tech-*

nical Publication no. 227, 1958, 30 p. $1.25.

Thermal conductivity, thermal expansion, specific heat, and density. Thermal diffusivity may be calculated from the known values of thermal conductivity, specific heat, and density. Experimental determination of these thermal properties of two grades of aluminum, chromium, copper, inconel, magnesium, molybdenum, Monel K, and four grades of steel.
(P11; Al, Cr, Cu, Ni, Mg, Mo, ST)

Q Mechanical Properties and Tests

466-Q.* Effect of Hydrogen on the Fatigue Properties of Titanium and Ti-8 Pct Mn Alloy. L. W. Berger, W. S. Hyler and R. I. Jaffee. *AIME Transactions,* v. 212, Feb. 1958, p. 41-45.

Additions of 390 ppm. hydrogen to A-55 Ti and 368 ppm. to 8% Mn alloy have no deleterious effect on the unnotched and notched rotating-beam fatigue properties. These amounts of hydrogen are sufficient to cause severe notch-impact embrittlement in A-55 Ti and pronounced loss of tensile ductility in 8% Mn alloy. Lack of embrittling effect in fatigue in the latter alloy is consistent with the postulated strain-aging mechanism of hydrogen embrittlement in alpha-beta alloys. 14 ref. (Q7, Q26s; Ti-b, *H*)

467-Q.* Anomalous Behavior During Cold Working and Subsequent Heating of Certain Magnesium Base Alloys. J. C. McDonald. *AIME Transactions,* v. 212, Feb. 1958, p. 45-46.

Magnesium alloy with 1.5% Mn and 0.2% Ce (mischmetal) was cold rolled 60%, starting from 0.040 in. Studies show considerable hardening in as little as 3 min. at 400° F. (e.g., tensile yield strength increased 50%). Softening at higher temperatures is easily explainable in terms of observed recrystallization. There is no explanation of the work softening, followed by the anneal hardening. 8 ref.
(Q-general, 2-64, 3-68; Mg-b)

468-Q.* Effect of Crystallographic Orientation and Oxygen Content on Knoop Hardness Values of Iodide Titanium. C. Feng and C. Elbaum. *AIME Transactions,* v. 212, Feb. 1958, p. 47-50.

Knoop hardness measurements were carried out on large grains of iodide titanium containing different amounts of oxygen. For each oxygen content the hardness is recorded as a function of the crystal orientation and of the angle ϕ between the indenter diagonal and the projection of the C (hexad) axis in the surface. 9 ref. (Q29, 3-72; Ti)

469-Q.* Hydrogen Embrittlement of Vanadium by Catalytic Decomposition of Water With Manganese. B. W. Roberts, G. W. Sears and P. D. Zemany. *AIME Transactions,* v. 212, Feb. 1958, p. 71-73.

Vanadium metal is embrittled by hydrogen at a temperature as low as 250° C. when held in the presence of Mn metal and water vapor in a rough vacuum. Property changes are caused by the catalytic decomposition of water vapor at the V surface and the diffusion into and solution in the V of the resultant hydrogen. Mn is a necessary component of the catalyst. 9 ref.
(Q26s, 2-63, P13c; V)

470-Q. Fracture of Temper Brittle Steel. L. D. Jaffe and D. C. Buffum. *AIME Transactions,* v. 212, Feb. 1958, p. 73-74.

Alloy steels display two forms of temper brittleness, which may be called upper-nose and lower-nose. Upper-nose can be distinguished from lower-nose temper brittleness by visual inspection of the fractured surface of specimens broken under such conditions that the fracture is brittle. 5 ref. (Q26s; ST)

471-Q. Rectangular Cracking in Lead. K. U. Snowden and J. N. Greenwood. *AIME Transactions,* v. 212, Feb. 1958, p. 91-92.

The rectangular pattern found in lead fatigue failures can be caused by boundary migration. Boundaries which have reached a location making a 45° angle with the stress are particularly subject to atmospheric attack. A crack starts and this locks the boundary from further migration. (Q7, M27f; Pb)

472-Q. Anelastic Measurements on the Alloy Cu_3Au. W. A. Goering and A. S. Nowick. *AIME Transactions,* v. 212, Feb. 1958, p. 105½-106.

Measurements of the internal friction as a function of temperature were made in a torsion pendulum. 7 ref. (Q22, 2-61; Cu, Au)

473-Q.* Effect of Composition and Heat-Treatment on the Uniform Elongation and Flow Properties of Alpha-Beta Titanium Alloys. A. J. Griest, H. A. Robinson and P. D. Frost. *AIME Transactions,* v. 212, Feb. 1958, p. 117-121.

Flow characteristics and uniform elongation of alpha-beta Ti alloys in the solution treated condition are markedly affected by the solution temperature. Two classes of alpha-beta alloys were distinguished, based on the effect of solution temperature on the uniform elongation. Martensitic alpha-beta alloys, which are relatively weakly beta-stabilized, showed decreasing values of uniform elongation as the solution temperature was initially increased.
(Q24, 2-60, 2-64; Ti-b)

474-Q.* Twinning and Cleavage in Tantalum. C. S. Barrett and R. Bakish. *AIME Transactions,* v. 212, Feb. 1958, p. 122-123.

Impact deformation of Ta sheet produces twins at −196 but not at −77 or 25° C. The twins are on {112} planes. Small amounts of crystallographic cleavage were observed under impact at −196° C. Cleavage facets were chiefly on {110} planes. (Q24b, Q26n; Ta-a)

475-Q.* Tensile Strength of Sintered Iron Powder as a Function of Surface Area and Particle Shape. P. R. Basford and S. B. Twiss. *AIME Transactions,* v. 212, Feb. 1958, p. 124-130.

Relationship between areas of iron powders, briquettes and sintered compacts and tensile strength. Two types of areas exist in such powders —a macroscopic area due to the shape and size of particles and a microscopic area due to pores and cracks in the surface. Only the macroscopic area, specifically the area due to particle irregularity, contributes to tensile strength. 16 ref. (Q27a, H12j; Fe, 6)

476-Q.* Theory of Brittle Fracture in Steel and Similar Metals. A. H. Cottrell. *AIME Transactions,* v. 212, Apr. 1958, p. 192-203.

Fracture and plastic deformation; theory of the yield point; nucleation of cracks by slip; ductile-brittle transition in unnotched tensile specimens; notch brittleness.
(Q26s, Q23r; ST)

477-Q.* Activation Energies for Creep of Single Aluminum Crystals Favorably Oriented for (111) [101] Slip. J. L. Lytton, L. A. Shepard and J. E. Dorn. *AIME Transactions,* v. 212, Apr. 1958, p. 220-225.

Creep of single Al crystals occurs by three unique processes, characterized by three distinct and isolatable activation energies: The 35,000-cal-per-mole activation energy obtained at the highest temperatures was ascribed to a dislocation climb process; the 28,000-cal-per-mole activation-energy process, occurring over the intermediate-temperature range, was attributed to a cross-slip mechanism; and it was suggested that the 3400-cal-per-mole process observed below 400° K. may be the Peierls energy. 17 ref.
(Q3, P13a; Al, 14-61)

478-Q.* Effect of Surface Films on Cadmium Crystals. M. Metzger and T. A. Read. *AIME Transactions,* v. 212, Apr. 1958, p. 236-243.

Strengthening effects of hydroxide and synthetic plastic films in the creep of Cd crystals studied. Results were broadly consistent with the naive mechanical model. Dislocation-film reactions and the significance of macroscopic stresses associated with certain films. 29 ref.
(Q3, 3-66; Cd)

479-Q. A Method for Observing the Progress of Deformation in Tensile Samples. A. P. Young and L. L. Marsh. *AIME Transactions,* v. 212, Apr. 1958, p. 247-249.

Use of plastic replicas taken from a tensile sample of uranium during testing. Record of deformation can be made as nearly continuous as is desirable by taking replicas at small strain intervals.
(Q27, M20r; U)

480-Q.* Ductility of Silicon at Elevated Temperatures. D. W. Lillie. *AIME Transactions,* v. 212, Apr. 1958, p. 249-251.

Considerable ductility exists in bulk specimens of polycrystalline high-purity Si. The possibility of hot forming at 1200° C. is suggested. 5 ref. (Q23p, 2-62; Si)

481-Q.* Observations on Homogeneously Bent Silicon Crystals. U. F. Kocks. *AIME Transactions,* v. 212, Apr. 1958, p. 251-252.

Single slip and a single parallel array of edge dislocations have been obtained in Si single crystals by homogeneously bending them in a four-point dead-loading device at 1000° C. around the [211] axis with [251] as the tensile axis which encloses an angle of 40° with the glide plane. 7 ref. (Q24a, M26b; Si)

482-Q.* The Temperature Dependence of Flow and Fracture in Coated Zinc Single Crystals. L. C. Weiner. *AIME Transactions,* v. 212, Apr. 1958, p. 253-256.

For Zn single crystals, $X_o = 3°$, a surface coating raises both the cleavage and yield strengths over a large temperature range. The "brittle temperature", associated with slip after completion of twinning, does not coincide with the point of intersection of the flow and cleavage curves, which is associated with

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

twinning. A surface film has no effect on the brittle temperature. 9 ref. (Q24, Q23r, Q26s; Zn, 14-61)

483-Q.* Pyramidal Slip in Magnesium. R. E. Reed-Hill and W. D. Robertson. *AIME Transactions,* v. 212, Apr. 1958, p. 256-259.

Slip on {1122} planes, which do not contain a close-packed direction, has been identified on crystals strained at −190° C. Evidence also shows that {1011} pyramidal slip is a mode of deformation at 25° C. in a limited orientation range. 10 ref. (Q24a; Mg)

484-Q.* Size Effects in the Deformation of Aluminum. R. L. Fleischer and Bruce Chalmers. *AIME Transactions,* v. 212, Apr. 1958, p. 265-274.

Aluminum single crystals and bicrystals of various cross-sectional dimensions were deformed in tension. Typical stress-strain curves; effects of changes in crystal dimensions; effects of growth rate used in preparation of crystals. Macroscopic constraints at a grain boundary are responsible for the most prominent grain-boundary effect, the production of multiple slip. 41 ref. (Q24, M27f; Al, 14-61)

485-Q.* Detection of Fatigue in Metals. R. F. Hanstock. *British Journal of Applied Physics,* Supp. 6, 1957, p. S48-S50.

Brief review of the nature of fatigue and of the methods employed to detect development. Potential value of these methods as primitive nondestructive tests to reveal fatigue in its least dangerous stage (i.e., prior to the development of serious structural weakness). 13 ref. (Q7, 1-54)

486-Q. Structural Changes and Energy Dissipation During Fatigue in Copper. N. Thompson and N. J. Wadsworth. *British Journal of Applied Physics,* Supp. 6, 1957, p. S51-S55.

5 ref. (Q7, M27; Cu)

487-Q. Measurement of Elastic Constants by the Ultrasonic Pulse Method. M. F. Markham. *British Journal of Applied Physics,* Supp. 6, 1957, p. S56-S63.

6 ref. (Q21, 1-74)

488-Q. Alloy Resists Jet Heat. *Chemical and Engineering News,* v. 36, May 19, 1958, p. 48-50.

Nickel-chromium-tungsten alloy can increase operating temperature to 1800° F. (Q-general, 2-62, T24b, 17-57; SGA-h, Ni, Cr, W)

489-Q. Super-Strength Alloys. *Design News,* v. 13, Mar. 1958, p. 100-101, 102.

Chart compiled by ASTM showing chemical composition and rupture strength at 1000 psi. of various alloy systems. (Q3m; SGB-a)

490-Q. Brittle Fracture. G. M. Boyd. *Engineer,* v. 205, Jan. 31, 1958, p. 174-175.

General discussion; conditions under which brittle fracture occurs; effect of temperature and welding and remedial measures. (Q26s)

491-Q. Brittle Fracture in Steel as Related to Flash-Welded Line Pipe. Pt. 2. M. A. Scheil, G. E. Fratcher, S. L. Henry and E. H. Uecker. *Engineering Journal,* v. 41, Mar. 1958, p. 59-63.

Concepts of brittle fracture for 0.20% to 0.30% C, medium Mn steel. 9 ref. (Q26s, T28p; ST, 1-57)

492-Q. A Qualitative Separation of Wear Factors. L. Rozeanu and O. Preotescu. *Engineers Digest,* v. 19, Mar. 1958, p. 102-105. (From *Revue de Mecanique Appliquee,* v. 2, no. 1, 1957.)

Study of adhesive, corrosive, abrasive and fatigue wear. (Q9)

493-Q.* The Structure and Mechanical Properties of High-Purity Aluminum-Zinc-Magnesium Alloys. P. C. Varley, M. K. B. Day and A. Sendorek. *Institute of Metals, Journal,* v. 86, Apr. 1958, p. 337-351.

Super-purity-base alloys of Al, Zn and Mg, when quenched from 465° C. and naturally aged, showed a steady improvement in mechanical properties with a decrease in ductility. As the alloying content and the time of aging were raised the fractures became increasingly intercrystalline and brittle. With a standard artificial aging treatment of 16 hr. at 135° C. there was again a steady rise in tensile strength and proof stress with increasing alloying additions, and a maximum was reached with 9% addition. 7 ref. (Q-general, N7a; Al-b, *Zn, Mg*)

494-Q.* A New Investigation of Anomalies in Chromium. H. Pursey. *Institute of Metals, Journal,* v. 86, Apr. 1958, p. 362-368.

Elasticity measurements on samples of pure and impure Cr from −200 to +150° C. Elastic anomaly is interpreted as a change in volume of the material at a certain temperature, which is a function of the stress on the material. Hence, if the temperature of a specimen is fixed and the stress varied, an anomalous expansion or contraction occurs as the material changes from its modified to its unmodified form. 17 ref. (Q21; Cr)

495-Q. Study of Metal-Working Processes. Non-Homogeneous Deformation of Material. *Iron and Coal Trades Review,* v. 176, Feb. 14, 1958, p. 393-395.

Survey of available methods of studying nonhomogeneous deformation in metals. (Q24f, F-general)

496-Q. Measurements of Quenching Stresses in a Bearing Ring by Interference Fringes. Toshio Mura and Hiroshi Yoshimoto. *Journal of Applied Physics,* v. 29, Feb. 1958, p. 115-119.

6 ref. (Q25h, J26, T7d)

497-Q. Internal Friction in Aluminum at Low Temperatures. A. J. Filmer, G. J. Hutton and T. S. Hutchison. *Journal of Applied Physics,* v. 29, Feb. 1958, p. 146-148.

7 ref. (Q22, 2-63; Al)

498-Q. Vickers Hardness and Compressive Strength. D. S. Dugdale. *Journal of Mechanics and Physics of Solids,* v. 6, 1958, p. 85-91.

Hardness and compression tests are reported for a wide variety of materials. A simple empirical method for relating hardness number to the stress-strain curve is suggested. The correlation obtained leads to the conclusion that the Vickers test is not at all sensitive to yield stresses corresponding to compressive strains greater than 0.15. 8 ref. (Q29, Q28)

499-Q.* Propagation of Fatigue Cracks in Sheet Specimens. N. E. Frost and D. S. Dugdale. *Journal of Mechanics and Physics of Solids,* v. 6, no. 2, 1958, p. 92-110.

Fatigue tests on mild steel, Al alloy and Cu sheet specimens containing a small central slit. Growth of the fatigue cracks initiated by the slit was measured as the test proceeded. In some of the mild steel specimens a plastic zone was visible around the growing crack. Measurements of the plastic zone showed that a state of geometrical similarity existed between the crack length and plastic zone dimensions. For low stresses the crack growth was sometimes erratic, but the rate of growth was proportional to the current crack length. 14 ref. (Q7; 4-53, 9-72, CN, Al, Cu)

500-Q. Basal Slip in Zinc Under Static and Dynamic Loading. T. Vreeland, Jr., D. S. Wood and D. S. Clark. *Journal of Mechanics and Physics of Solids,* v. 6, no. 2, 1958, p. 111-126.

Stress required to produce a given permanent basal shear strain in single crystals of Zn is much greater under dynamic than static conditions. 10 ref. (Q24a; Zn, 14-41)

501-Q. Effect of Friction on Compression and Indentation Between Flat Dies. J. F. W. Bishop. *Journal of Mechanics and Physics of Solids,* v. 6, no. 2, 1958, p. 132-144.

8 ref. (Q9p, Q28g, W22a)

502-Q.* Factors Affecting Residual Stress in Electrodeposited Metals. Joseph B. Kushner. *Metal Finishing,* v. 56, Apr. 1958, p. 46-51.

Residual stresses in electrodeposited metals vary with deposit thickness. Stress is usually high at first and then diminishes to a constant value in the neighborhood of 0.001 to 0.002-in. deposit. Test runs were made and typical results are plotted. (To be continued.) (Q25h; 8-62)

503-Q.* Factors Affecting Residual Stress in Electrodeposited Metals. Pt. 2. Joseph B. Kushner. *Metal Finishing,* v. 56, May 1958, p. 82-87.

Variation of residual stress with thickness and temperature, effect of current density, and of contaminants and addition agents, regarding deposit of Ni films on Cu. (Q25h; 8-62, Cu, *Ni*)

504-Q.* Creep Properties of Three Copper Alloys. J. McKeown and R. D. S. Lushey. *Metal Industry,* v. 92, Apr. 25, 1958, p. 327-329.

Creep properties of gunmetal (85% Cr, 5% Zn, 5% Sn, and 5% Pb) and 60-40 brass, hot stamped at 700 and 800° C., were examined. Tensile strength, 0.1% proof stress, elongation, Young's modulus, and hardness. (Q3, Q-general; Cu-b)

505-Q.* Alloys of Titanium and Zirconium Containing Tin. R. F. Smart. *Metallurgia,* v. 57, Apr. 1958, p. 181-188.

Literature review. Phase diagram, oxidation resistance, high-temperature strength, creep properties, hardness and other mechanical properties of Zr and Ti alloyed with Sn. 30 ref. (Q-general, M24; Ti, Zr, *Sn*)

506-Q.* "Size" Effects and Their Possible Significance for "Non-Propagating" Cracks in Metal Fatigue. W. J. Harris. *Metallurgia,* v. 57, Apr. 1958, p. 193-197.

Relationship of fatigue strength to an intrinsic block structure or "flaw" pattern in polycrystalline solids. Elements of crystalline slip; significance of intrinsic flaw patterns in explaining "size" effects, and nonpropagating effects in fatigue of metals. 15 ref. (Q7)

507-Q.* Coming: Better Thermenol Alloys. W. J. Buehler and C. G. Dalrymple. *Metal Progress,* v. 73, May 1958, p. 78-81.

Iron-aluminum alloys with 3 to 4% Mo have excellent oxidation resistance and stress-rupture strength. With small additions of Zr and carbon to raise the mechanical prop-

erties and inhibit the grain growth, the alloys are useful for many high-temperature applications. 5 ref.
(Q-general, P-general; SGA-h, Fe, Al)

508-Q.* Castings for Tougher Jobs. Carl F. Joseph. *Metal Progress,* v. 73, May 1958, p. 104-108.

Pearlitic malleable iron is opening up new horizons for cast parts in automotive and other applications. A new grade of higher hardness has been developed for parts requiring good wear resistance toughness in the as-machined state. Machinable castings, with even higher hardness—up to Brinell 400—are in the future picture.
(Q-general, E11, 17-57; CI-s)

509-Q. Effect of Phosphorus and Manganese on Temper Brittleness. N. V. Tolstoguzov and A. D. Kramarov. (Digest from *Metallovedenie i Obrabotka Metallov,* no. 2, 1957.) *Metal Progress,* v. 73, May 1958, p. 172, 174.

(Q26s, 2-62; ST, *P, Mn)*

510-Q. In the Missile Era Materials Build a New Technology. W. C. Rous, Jr. *Missiles and Rockets,* v. 3, Mar. 1958, p. 91-100.

Operational stress and temperature histories in relation to design requirements.
(Q-general, 2-62, 17-51, T24e, 17-57; Ti, SS)

511-Q. Single-Crystal Elastic Constants of Indium. D. R. Winder and Charles S. Smith. *Physics and Chemistry of Solids,* v. 4, no. 1/2, 1958, p. 128-134.

Elastic constants of tetragonal In as measured by the ultrasonic pulse-echo method. 11 ref. (Q21; In, 14-61)

512-Q. Casting Alloy Enters High-Strength Field. E. G. Opsahl and W. H. Sparing. *Product Engineering,* v. 29, Apr. 28, 1958, p. 84-85.

Wearpact, a special steel, offers advantages in cost and easier fabrication. Properties and design tips.
(Q-general, E25p; 17-51, AY-b)

513-Q.* Tensile Properties of Uranium From Room Temperature to 600° C. N. H. Hancock. *United Kingdom Atomic Energy Authority,* AERE M/R 1156, 1957, 22 p.

Variation from room temperature to 600° C. of proof stress, ultimate tensile strength, Young's modulus and elongation, of two casts of pure uranium and an alloy with 4.9% Mo. Variation of the ratio of Brinell hardness to ultimate tensile strength and proof stresses for the two nominally pure uranium casts. 7 ref. (Q27a, 2-61; U)

514-Q. An Evaluation of Fatigue Properties of Titanium and Titanium Alloys. J. G. Weinberg and I. E. Hanna. Battelle Memorial Institute. (Office of Assistant Secretary of Defense for Research and Engineering.) *U. S. Office of Technical Services,* PB 121631, July 1957, 145 p. $3.75.

Review. (Q7; Ti)

515-Q. Properties of Titanium Alloys at Elevated Temperatures. F. R. Schwartzberg, F. C. Holden, H. R. Ogden and R. I. Jaffee. Battelle Memorial Institute. (Office of Assistant Secretary of Defense.) *U. S. Office of Technical Services,* PB 121634, Sept. 1957, 228 p. $6.

(Q-general; 2-62; Ti)

516-Q. An Investigation of Three Ferritic Steels for High-Temperature Application. A. P. Coldren and J. W. Freeman. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131069, Apr. 1957, 117 p. $3.

(Q-general, N8, 2-62; SS, SGA-h)

517-Q. Thermal Stresses and Thermal Buckling. J. Singer, M. Anliker and S. Lederman. Polytechnic Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131072, Apr. 1957, 120 p. $3.

(Q25p)

518-Q. Effects of Vibrations on the Yield Strength of a Low-Carbon Steel. G. E. Nevill, Jr., and F. R. Brotzen. Rice Institute. (Air Force Office of Scientific Research.) *U. S. Office of Technical Services,* PB 131260, Apr. 1957, 31 p. $1.

In the 15 to 80 kc. frequency range, applied mechanical vibrations reduce the steady stress necessary to initiate yielding in tension in a low-carbon steel specimen. This decrease in yield strength is proportional to the vibrational amplitude.
(Q23b; CN)

519-Q. Investigation of Materials Fatigue Problems. H. N. Cummings, F. B. Stulen and W. C. Schulte. Curtiss-Wright Corp. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131288, Mar. 1957, 221 p. $5.50.

Fatigue properties of high-strength steels. (Q7; ST, SGB-a)

520-Q. Temperature and Stress Dependence of the Atmosphere Effect on Nichrome V. P. Shahinian and M. R. Achter. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131339, Oct. 1957, 17 p. $.50.

Creep rupture tests were performed on the alloy in vacuum and in air at 1100, 1300, 1500, 1700 and 1900° F. (Q3r, 1-73, 3-66; Cr, Ni)

521-Q. Hydrogen, Crack Initiation, and Delayed Failure in Steel. H. H. Johnson, J. C. Morlet and A. R. Troiano. Case Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131340, May 1957, 52 p. $1.50.

(Q7, 9-72; ST, *H*)

522-Q. Comparison of the Creep-Rupture Properties of Nickel in Air and in Vacuum. P. Shahinian and M. R. Achter. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131344, Oct. 1957, 11 p. $.50.

(Q3r, 1-73, 3-66; Ni-a)

523-Q. Correlation of Literature on the Effect of Testing Temperature on the Mechanical Properties of Wrought Aluminum Base Alloys. H. R. Pritchard. Frankford Arsenal. *U. S. Office of Technical Services,* PB 131346, May 1955, 117 p. $3.

(Q-general, 2-61; Al)

524-Q. Fatigue Investigation on High Strength Steel. J. K. Childs and M. M. Lemcoe. Southwest Research Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131371, July 1957, 44 p. $1.25.

(Q7; ST, SGB-a)

525-Q. Physical Properties of Monolayers Adsorbed at the Solid/Air Interface. Pt. 3. Friction and Durability of Films on Stainless Steel. R. L. Cottington, E. G. Shafrin and W. A. Zisman. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131493, Dec. 1957, 18 p. $.50.

(Q9p, 14-62; SS)

526-Q. Research on the Effects of Stress, Strain, and Temperature on the Eutectoid Decomposition of Titanium Alloys. A. W. Goldenstein, A. G. Metcalfe and W. Rostoker. Armour Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131610, Nov. 1957, 72 p. $2.

(Q26s, N9, 2-61, 3-66; Ti, *Cr*)

527-Q.* Plastic Theory of Structures. Pt. 1. T. M. Charlton. *Welder,* v. 27, Jan-Mar. 1958, p. 11-15.

Plastic theory of structures and its application to determination of load-carrying capacity. Formation of plastic hinges in structural members. (To be continued.) (Q23; SGB-s)

528-Q. Brittleness Problem Faced in Ship Welding. Earl Parker. *Western Metalworking,* v. 16, Apr. 1958, p. 44.

(Q26s, T22g; 7-51, ST)

529-Q. Static Strength of Spot-Welded Joints. A. N. Dorofeev. *Avtomaticheskaya Svarka,* v. 9, no. 2, 1956, p. 58-66. (Henry Brutcher, Altadena, Calif., Translation no. 3802.)

Previously abstracted from original. See item 565-Q, 1956.
(Q23, K3, 7-51)

530-Q. Influence of Impurities on the Properties of High-Temperature Strength Nickel-Chromium Alloys. M. V. Pridantsev and G. V. Estulin. *Stal',* v. 17, no. 7, 1957, p. 636-640. (Henry Brutcher, Altadena, Calif., Translation no. 4088.)

Previously abstracted from original. See item 1063-Q, 1957.
(Q-general, 3-69; ST, SGA-h)

531-Q. Effect of Preceding Cold Working and Annealing Upon Initial Stage of Plastic Deformation and Subsequent Recrystallization of Iron. Ya. R. Rauzin. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1958, p. 38-42. (Henry Brutcher, Altadena, Calif., Translation no. 4123.)

Influence of prior plastic deformation by rolling or forging followed by a process anneal upon susceptibility to grain growth, critical strain, etc. Extent to which yield point and yield-point elongation are affected by the amount of initial reduction. Fallacy of current explanation advanced for effect of initial hot or cold working on tendency of steel to grain growth.
(Q24, N3, 3-68; Fe, ST)

532-Q. Ductility of Cold-Rolled Transformer Sheet. A. G. Petrenko. *Stal',* v. 17, no. 5, 1957, p. 453-456. (Henry Brutcher, Altadena, Calif., Translation no. 4134.)

(Q23p; ST, 4-53)

533-Q. Indentors of High Heat Resistance for Hardness Tests on Metals up to 1300° C. in Vacuo. M. G. Lozinskiy and M. B. Guterman. *Zavodskaya Laboratoriya,* v. 22, no. 11, 1956, p. 1358-1363. (Iron and Steel Institute Translation no. 933; Henry Brutcher, Altadena, Calif., Translation no. 4138.)

Previously abstracted from original. See item 344-Q, 1957.
(Q29p, 1-53, 1-73)

534-Q. Mechanical Properties of Some Ultra High Strength Steels. I. V. Paisov and So Yun Ho. *Metallovedenie i Obrabotka Metallov,* no. 2, Feb. 1958, p. 2-6. (Henry Brutcher, Altadena, Calif., Translation no. 4140.)

Development of two structural steels combining very high tensile with satisfactory impact strengths. Chemical composition, hardenability, mechanical properties between room temperature and 30° C.
(Q-general; J5; ST, SGB-a)

535-Q. Characteristics of Fatigue Failure of Alloys at High Temperature. V. A. Parfenov. *Metallovedenie i Obrabotka Metallov,* no. 2, Feb. 1958, p. 19-22. (Henry Brutcher, Altadena, Calif., Translation no. 4148.)

(Q7, 2-62; SGA-h, Ti-b)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

536-Q. Mechanical Properties of Electrodeposited Copper as Depending on Electrolysis Conditions and Electrolyte Composition. A. M. Ginberg and Yu. A. Klyachko. *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1958, p. 35-37. (Henry Brutcher, Altadena, Calif., Translation no. 4151.)

(Q-general, L17a; Cu, 8-62)

537-Q. Fatigue Strength of Austenitic Steels Exposed to Corrosive Gases at High Temperatures. A. V. Ryabchenko and E. L. Kazimirovskaya. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 6-10. (Henry Brutcher, Altadena, Calif., no. 4164.)

(Q7a, R6g, 2-62; SS)

538-Q. (English.) Problems of Elastic Dislocation and Their Application on Residual Welding Stresses. Koichi Masubuchi and Toshio Yada. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 23-26.

Utilizes similarities between wing theory in aerodynamics and residual stresses due to welding to explain several hitherto unresolved problems that arise from welding stresses. 6 ref. (Q25h; 7-51)

539-Q. (English.) Fatigue Life of Metals Under Varying Repeated Stresses. Toshio Nishihara and Toshiro Yamada. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 61-64.

New criterion on fatigue failure and analytical procedure predicting fatigue life under varying stresses. (Q7b)

540-Q. (English.) Branch Point of Notched Fatigue Specimens. Tadasi Isibasi. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 71-73.

7 ref. (Q7a, 1-60)

541-Q. (English.) Determination of the Distribution of Maximum Shearing Stress on Metal Surfaces by Means of Electroplating Method. Hirosi Watanabe. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 103-106.

Method consists of observing continuous growth of strain figures due to formation of flecks appearing on surface of electroplated Cu subjected to fatigue. (Q2j, Q7; Cu, 8-12)

542-Q. (English.) Measurement of Residual Stress by Gunnert's Method. Hirosi Watanabe. *Sixth Japan National Congress of Applied Mechanics, Proceedings*, Mar. 1957, p. 107-110.

Effects of variations of supporting conditions of Gunnert's tensometer; some methods to make errors minimum. 8 ref. (Q25h, 1-54)

543-Q. (English.) Measurements of Quenching Stresses in Rings. Toshio Mura. *Sixth Japan National Congress of Applied Mechanics, Proceedings*, Mar. 1957, p. 111-115.

8 ref. (Q25, 1-54, J26)

544-Q. (English.) Studies of Plastic Deformation by the Photoplastic Method. Masataka Nisida, Minoru Hondo and Taizo Hasunuma. *Sixth Japan National Congress of Applied Mechanics, Proceedings*, Mar. 1957, p. 137-140.

Theoretical solutions for elastic-plastic problems in which a portion of material is plastic and remainder elastic. (Q24, Q21)

545-Q. (English.) Influence of Stress Change on the Primary Creep of Low-Carbon Steel. Toshio Nishihara, Shuji Taira, Kichinosuke Tanaka and Kiyotsugu Ohji. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 213-216.

Creep tests made under pulses of constant stresses at fixed temperature of 450° C. A theory is projected on mechanism of creep. 4 ref. (Q3r, 3-66; CN)

546-Q. (English.) Anisotropy of 70-30 Brass and Aluminum. Moriya Oyane, Yoshinori Tsunekawa and Kohei Kojima. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 217-220.

Influence of work hardening, Bauschinger effect, rolling and recrystallization textures, and deformed shapes of the crystal grains. (Q24g; Al-b; Cu-n)

547-Q. (English.) Investigation on the Dynamic Creep Rupture of Materials. Toshio Nishihara, Shuji Taira, Kichinosuke Tanaka and Ryoichi Koterasawa. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 221-224.

Analysis of stress range diagram of dynamic creep rupture on basis of results concerned with fracture of low-carbon steel at elevated temperature under alternating stress. 4 ref. (Q3m, 2-62; CN)

548-Q. Mechanism of Friction Between Metal Surfaces. Pt. 1. Influence of Surface Roughness. Gennosuke Yoshimoto and Tadasu Tsukizoe. *Sixth Japan National Congress for Applied Mechanics, Proceedings*, Mar. 1957, p. 235-238.

(Q9p)

549-Q. (English.) Fatigue Fracture Criterion in Metals Based on Dislocation Theory. Takeo Yokobori. *Tohoku University, Technology Reports*, v. 22, no. 1, 1957, p. 51-61.

Study of unique dislocation model of fatigue fracture so as to clarify the micromechanism of fatigue damage in early stages. 21 ref. (Q7, M26b)

550-Q. (French.) Creep Characteristics of Steels for Gas Turbines. C. Roques, Ch. Dubois and P. Bastien. *Revue de Metallurgie*, v. 55, Mar. 1958, p. 227-242.

21 ref. (Q3, W11m, 17-57; ST)

551-Q. (French.) A Statistical Presentation of Fatigue Test Results. J. Strebelle. *Revue de la Soudure*, v. 14, no. 1, p. 24-32.

(Q7, S12)

552-Q. (French.) Results of Fatigue Tests on Butt-Welded Joints in Different Countries. R. Cazaud. *Revue de la Soudure*, v. 14, no. 1, p. 49-50.

(Q7; 7-51)

553-Q. (French.) Fatigue Failure Results on Fatigue Test Machine. W. H. Munse. *Revue de la Soudure*, v. 14, no. 1, p. 59-62.

Fatigue failures of actual structures could furnish more realistic information than laboratory fatigue tests if sufficient indication is given as to forces, stresses and numbers of load cycles. Fatigue cracks recently observed on two 90-ton fatigue test machines constructed in 1940 and used at the University of Illinois. Concluded that soldered beams under bending stress subjected to more than several million load cycles may fail under relatively small nominal maximal stresses. Need for further study of the effect of residual stresses, and pre-existing microscopic flaws on the weld failure. (Q7k; 7-51)

554-Q. (German.) Plastic Deformation of Carbides. E. Bryjak, etc. *Fertigungstechnik*, v. 8, Feb. 1958, p. 60-65.

Tungsten carbides with Co content up to 25% were investigated under the action of applied stresses on special equipment. Diameter and depth of deformation; metallographic examination, X-ray studies. Results on carbides with Co content under 10% apparently refute the theory supported by Dawihl that no permanent distortion occurs. 16 ref. (Q24; W, 6-69)

555-Q. (German.) Heat Resisting and Ultra-High Strength Steels. Lueb. *Fertigungstechnik*, v. 8, Feb. 1958, p. 66-69.

4 ref.
(Q-general, 2-62; ST, SGA-h, SGB-a)

556-Q. (German.) Semi-Automatic Hardness Testing. Kurt Potyka. *Werkstatt und Betrieb*, v. 91, May 1958, p. 271-272.

Partly automatic Rockwell hardness tester, the test pressure being exerted by an integrated pedal-operated motor. (Q29, 1-53)

557-Q.* (Japanese.) Coefficient of Dry Friction of Metals. Riitsu Takagi and Yuko Tsuya. *Journal of Mechanical Laboratory*, v. 12, Jan. 1958, p. 12-17.

To eliminate lubricating properties of thin oxide surface films specimens of Cu, Fe, Ni, Mo, W and Sn were heated in a vacuum for hydrogen atmosphere before tests. Coefficient of friction of metals sliding on similar metals were measured at room temperatures in vacuum or hydrogen atmosphere. 7 ref. (Q9p; Cu, Fe, Ni, Mo, W, Sn)

558-Q.* (Japanese.) On Indentation Hardness Testing. Pt. 1. Shigehiko Yazawa, Masao Unno, Iwakichi Sawano and Shigeru Yamamoto. *Journal of Mechanical Laboratory*, v. 12, Jan. 1958, p. 18-21.

Indentation hardness measurements on steel blocks partially plated with Zn, Cu, Ni or Sn 1 micron thick. Plated portions gave smaller hardness numbers than unplated portions of the block. Variations due to differences of friction between indenter and surfaces of the blocks. (Q29b)

559-Q.* (Japanese.) Ball Indentation. Pt. 1. Experiments on Specimens of Definite Dimensions. Shigehiko Yazawa, Kiyoshi Sato, Masao Unno, Masayoshi Tsutsumi and Go Yaguchi. *Journal of Mechanical Laboratory*, v. 12, Jan. 1958, p. 22-30.

Steel balls under various loads used for indenting annealed steel specimens containing 0.19 and 0.24% C. Luders' lines on the surfaces of specimens and recorded profiles of impressions. Concluded that index and constants are functions of the friction between indenter and specimen surfaces. 5 ref. (Q29b; CN)

560-Q. (English.) Experimental Study on the Static Strength of Perforated Strips and Riveted Joints of Commercially Pure Titanium. Shoji Shimamura and Yusei Noguchi. *Journal of Mechanical Laboratory of Japan*, v. 3, no. 2, 1957, p. 95-96. (From *Journal of Mechanical Laboratory*, v. 11, 1957, p. 194.)

Previously abstracted from original. See item 270-Q, 1958. (Q27; Ti)

561-Q. (Japanese.) Relation Between Actual Grain Size and Fatigue Strength of Axle Steels for Rolling Stock. Rikuo Inoue. *Sumitomo Metals*, v. 9, Oct. 1957, p. 216-220.

(Q7a, M27c, T7j; ST)

562-Q.* (Russian.) Mechanism of Failure in Alloy EI437 When Exposed to Prolonged Strain at Elevated Temperatures. S. T. Kishkin and A. A.

Klipin. *Metallovedenie i Obrabotka Metallov*, Dec. 1957, p. 36-40.

Fissures originate and develop at 700-800° C. under prolonged action of static load exclusively at the grain boundaries normal to the acting force. This is an indication of weakness at the grain boundary. More rapid failure under repeated heating and cooling is caused by intensive development of cracks. 5 ref. (Q26, 2-62, SGA-h)

563-Q. (Russian.) **Strengthening of Technical Aluminum by Cold Drawing.** Marius Protopopesku. *Revue de Métallurgie (Bucarest)*, v. 2, 1957, p. 91-106.

(Q23a, G4; Al-b)

564-Q. (Russian.) **Comparison of Metal-Ceramic and High Alloy Steel Cutting Tools.** V. Ya. Rassokhin and M. A. Pura. *Stanki i Instrument*, Feb. 1958, p. 12-14.

6 ref. (Q-general; TS, 6-70, SGA-j)

565-Q. (Russian.) **Research on Ball and Roller Bearings.** N. A. Spitsyn. *Vestnik Mashinostroeniya*, v. 38, Mar. 1958, p. 3-8.

Study of heat and wear resistant steels most suitable for bearings. (Q-general, Q9n; ST, SGA-d)

566-Q. (Russian.) **Strength and Wear Resistance of Ball and Roller Bearing Components.** S. V. Pinegrin. *Vestnik Mashinostroeniya*, Mar. 1958, p. 8-11.

Use of Ni and Cr alloys for bearings operating under high temperatures. (Q27a, Q9n, T7d; Cr-b, Ni-b, SGA-d)

567-Q. (Russian.) **Seizing of Piston Rings in Diesel Engine of Locomotive D-50.** K. A. Grekov. *Vestnik Mashinostroeniya*, v. 38, Apr. 1958, p. 16-19.

(Q9p, T23n, T7)

568-Q. (Spanish.) **When Is Hammering Required to Obtain Optimum Results With Respect to Deformation and Residual Stresses in Welds?** R. Gunnert, H. Alida and L. Heiling. *Ciencia y Tecnica de la Soldadura*, v. 8, Jan-Feb. 1958, 16 p.

Tests were conducted at Chalmes Technological University, Gothenburg, on electric welded extra-low-carbon steel sheet; effects of variables such as weight of hammer, blows per minute, number of passes, length of electrode. 3 ref. (Q25h, G23n; ST, 4-53, 7-51)

569-Q. Thermal Creep Design Criteria. Robert Goldin. *Aeronautical Engineering Review*, v. 16, Dec. 1957, p. 36-41.

7 ref. (Q3, T24, 17-51)

570-Q.* Direct Stress Fatigue Tests on Redux-Bonded and Riveted Double Strap Joints in 10 S.W.G. Aluminum Alloy Sheet. S. Kelsey and J. B. Spooner. *Aeronautical Research Council*, C.P. no. 353, Dec. 1955, 48 p.

Bonded joints tended to fail by shear of the bond at the higher stress ranges and by tension of the sheet at the lower stress ranges. Riveted joints failed by tension across the first row of rivets in all cases, though tests on three-row riveted joints showed considerable improvement in endurance over those with two rows of rivets. Endurances were greater for bonded joints but with rather more scatter than for riveted joints, particularly where bond shear was the cause of failure. (Q7d; Al-b, 4-53, 7-53, 7-58)

571-Q.* Modern Concepts of Flow and Fracture. Earl R. Parker. *American Society for Metals, Transactions*, v. 50, 1958, p. 52-104.

The 1957 Edward De Mille Campbell Memorial Lecture. 71 ref. (Q26, Q25, Q24)

572-Q. Probability Theory of Fatigue. A. Ferro and R. Colombo. *Engineers' Digest*, v. 18, Nov. 1957, p. 487-490. (From *Metallurgia Italiana*, no. 7, 1957, p. 518-522.

Previously abstracted from original. See item 1053-Q, 1957. (Q7, S12)

573-Q.* Factors Influencing the Resistance of Steel Castings to High Stress Abrasion. T. E. Norman. *Modern Castings*, v. 33, May 1958, p. 89-98.

Study of martensitic, pearlitic and austenitic steels, mainly with high carbon contents. In general the martensitic steels had better abrasion resistance than the pearlitic steels. A wide range of abrasion factors is possible for each microstructure, depending on such factors as carbon content, austenitizing temperature, tempering temperature, alloy content and the fineness and resultant hardness of the pearlitic structure. 11 ref. (Q9n; CI, 5-60)

574-Q. Study of the Impact Behavior of High-Temperature Materials. H. B. Probst and H. T. McHenry. *National Advisory Committee for Aeronautics* TN 3894, Mar. 1957, 23 p.

The impact properties of titanium-carbide-base cermets, some high-temperature alloys and the intermetallic, NiAl, were obtained at room and elevated temperatures to 1750° F. The impact energies of cermets were found to increase with increased amounts of metallic binder. (Q6; SGA-h, 6-70)

575-Q. Rupture Strength of Several Nickel-Base Alloys in Sheet Form. J. H. Dance and F. J. Clauss. *National Advisory Committee for Aeronautics* TN 3976, Apr. 1957, 24 p.

(Q3m; Ni-b, 4-53)

576-Q. Tensile Properties of Aircraft-Structural Metals at Various Rates of Loading After Rapid Heating. Pt. 3. W. P. Roe and J. R. Kattus. Southern Research Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131511, Sept. 1957, 94 p. $2.50.

Effects of variations in strain rate and holding times on tensile properties of several aircraft structural sheet metals after heating within 10 sec. to test temperatures approaching the melting points of the alloys involved. (Q27, Q21a, P10d, T24a; SS, Ni-b, Ti-b, Al-b, Co-b, 4-53)

577-Q. Determination of the Tensile, Compressive and Bearing Properties of Ferrous and Nonferrous Structural Sheet Materials at Elevated Temperatures. D. E. Miller. Armour Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131595, Dec. 1957, 102 p. $2.50.

Data on aluminum, magnesium, titanium, stainless steel and alloy steel. (Q27, Q28, T24a, 2-62; Al-b, Mg-b, Ti-b, SS, ST, 4-53)

578-Q. Study of the Metallurgical Properties That Are Necessary for Satisfactory Bearing Performance and the Development of Improved Bearing Alloys for Service Up to 1000° F. G. K. Bhat and A. E. Nehrenberg. Crucible Steel Co. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131609, Nov. 1957, 73 p. $2.

Research aimed at obtaining such material properties as hot hardness, compressive yield strength, resistance to softening, and structural and dimensional stability. Twenty-nine steels were examined, ranging in type from SAE 52100 and its modifications, to hot work and other toolsteels. (Q-general, Q9p, 2-62; AY, SGA-c)

579-Q. Effect of Strain Hardening on Mechanical Properties of Carbon Steels. I. V. Kudryavtzev, T. V. Naumova and L. M. Rozenmann. *Metallovedenie i Obrabotka Metallov*, Mar. 1958, p. 2-6. (Henry Brutcher, Altadena, Calif. Translation no. 4171.)

Investigation on strain hardening using torsion method. Change of mechanical properties with increasing deformation and effect of heat treatment. Effect of strain hardening on fatigue strength. (Q-general, 3-68; CN)

580-Q. Study of Titanium-Stabilized 18% Cr, 12% Ni Steel for High-Pressure Steam Piping in Power Stations. A. S. Helman, T. S. Griboyedova, E. A. Davidovskaya, B. I. Lazarev, K. V. Lyubavsky, E. S. Slepak, I. I. Trunin and G. P. Fedortzov-Lutikov. *Metallovedenie i Obrabotka Metallov*, v. 4, Mar. 1958, p. 16-24. (Henry Brutcher, Altadena, Calif., Translation no. 4173.)

Effect of heat treatment and strain hardening on mechanical properties of steel; effect of aging; thermal fatigue; corrosion cracking; effect of arc welding. Optimal composition and optimal heat treatment. (Q-general; W11g, W13h, SS)

581-Q. Long-Term Creep and Aging Tests on Steels LA 1 and EI 257. M. I. Solonoutz. *Metallovedenie i Obrabotka Metallov*, Mar. 1958, p. 30-34. (Henry Brutcher, Altadena, Calif., Translation no. 4174.)

Composition of steels; alterations of structure and of composition of carbide phase; alteration of mechanical properties. (Q3, N7a; ST)

582-Q. Temporary Change in Mechanical Properties of Steel During Structural Transformations. V. G. Vorobyov. *Metallovedenie i Obrabotka Metallov*, Mar. 1958, p. 35-38. (Henry Brutcher, Altadena, Calif., Translation no. 4175.)

Increase of plasticity is dependent on phase or structural transformations. Experiments performed at conditions excluding diffusion of atoms. Effect of pretreatment on the development of superplasticity; probable mechanism of the phenomenon; practical importance of superplasticity. (Q23, N8; ST)

583-Q.* Medium and Low-Tungsten High Speed Steels Alloyed With Cobalt. M. S. Chaadayeva. *Metallovedenie i Obrabotka Metallov*, Mar. 1958, p. 48-53. (Henry Brutcher, Altadena, Calif., Translation no. 4177.)

Composition of experimental steels. Methods of treatment and their effect on mechanical properties. Metallographic study. Testing of cutters made from experimental steels. (Q-general, 2-60, TS-m)

584-Q. (French.) **Contribution to the Study of Wear of Carbide Metal Tools.** M. Lainey Broida. *Métaux Corrosion-Industries*, v. 33, Feb. 1958, p. 71-84.

Influence of cutting temperature, speed, cutting angle, cutting force and time on the rate of wear of carbide cutting tools. (Conclusion.) (Q9, G17, T6n; 6-69)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

585-Q.* (French.) **Brittle Fracture of Steels.** W. Felix and Th. Geiger. *Métaux Corrosion-Industries,* v. 33, Feb. 1958, p. 85-99.

Photomicroscopic and X-ray studies of the initiation and progress of brittle rupture produced in notched test specimens of a soft steel and of a steel alloyed with C, Si, Mn, Cr an Cu. Results are compared, through spectrographic examination and microhardness measurements, with observations on a furnace I-beam that failed in brittle fracture after 30 years. It is concluded that the deformation and orientation of the ferrite crystals are determining factors in the deformation and rupture processes. (Q26s; ST)

586-Q. (French.) **Hot Strength of Brazed Joints Made With Various Filler Materials.** Bernard Blanchet. *Soudage et Techniques Connexes,* v. 12, Mar-Apr. 1958, p. 101-106.

(Q2g, 2-62, 7-52; SGA-f)

587-Q. (French.) **Problem of Residual Stresses and Risks of Brittle Failure in Welded Constructions.** H. Gerbeaux. *Soudage et Techniques Connexes,* v. 12, Mar-Apr. 1958, p. 109-141.

48 ref. (Q25h, Q26s; ST, 7-51)

588-Q.* (French.) **Report of Fatigue Failures in Fatigue Machines.** W. H. Munse. *Soudage et Techniques Connexes,* v. 12, Mar-Apr. 1958, p. 148-151.

Description of cracks encountered in testing machines at the University of Illinois. Failures occurred when the equipment was 11 years old (after about 500,000,000 cycles on flexural members). Residual stresses in the welds may be responsible, and the existence of small cracks in the weld bead may serve to initiate the failures. (Q7, 7-51)

589-Q. (German.) **Velocity of Sound as a Characteristic Value for Assessing the Properties of Cast Iron.** Rolf Ziegler and Richard Gerstner. *Giesserei,* v. 45, Apr. 10, 1958, p. 185-193.

Dependency of velocity on modulus of elasticity. 9 ref. (Q21a, S14g; CI)

590-Q.* (German.) **Some Observations on Hard Metals for Use in Mining.** F. Kölbl. *Planseeberichte für Pulvermetallurgie,* v. 6, Apr. 1958, p. 22-26.

Hardness ranges of tungsten carbide-cobalt compositions suitable for coal, ore and rock drilling tools. Other material constants (elasticity constant and the compression and bending strengths) must be taken into account. 11 ref. (Q29n, Q-general, T28; W, *Co,* 6-69)

591-Q. (Italian.) **Cast Chromium-Nickel Austenitic Stainless Steels.** *Nickel,* Feb. 1958, p. 9-12.

Mechanical and physical properties, applications of A.C.I. CF-8 and CF-20 steels, to which Italian steels X10CN188 and X17CN188 correspond. (Q-general, P-general, 17-57; SS)

592-Q. (Rumanian.) **Study of Hardening During Cold Drawing of Commercial Aluminum.** Marius Protopopescu. *Studii si Cercetari de Metalurgie,* v. 2, no. 1-2, 1957, p. 9-22.

13 ref. (Q23a, G4; Al-b)

593-Q. (Russian.) **Fatigue Tests for Large Gears.** M. M. Kobrin and G. Z. Zaitsev. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 193-197.

6 ref. (Q7, T7a)

594-Q. (Russian.) **Investigation of Steel Embrittlement.** K. M. Pogodina-Alekseeva and G. I. Pogodin-Alekseev. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 198-201.

(Q26s; ST)

595-Q. (Russian.) **Determination of Heat Resistance of Sheet Steel.** M. Ya. L'lvovskii and I. A. Smiyan. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 202-203.

(Q-general, 2-61; ST, 4-53)

596-Q. (Russian.) **Testing Heat Resistant Sheet Steel and Alloys.** M. V. Pridantsev and A. R. Krylova. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 204-205.

(Q-general, 1-54, 2-61; ST, 4-53)

597-Q. (Russian.) **Improvements in Measurement of Deformation by Determination of Tension in Thin-Walled Tubes.** G. A. Deryagin. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 206-208.

(Q24, Q27, 4-60)

598-Q. (Russian.) **Device for Measurement of Endurance Strength of Metals.** V. N. Gulyaev and A. V. Ratner. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 226-228.

4 ref. (Q7, 1-53)

599-Q. (Russian.) **Determination of Fatigue Strength of Metals in an Active Liquid Medium.** A. I. Yatsyk and F. P. Yanchishin. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 229-230.

(Q7)

600-Q. (Russian.) **Preparation of Complex Models for Optical Investigation of Stress.** T. D. Maksutova and S. P. Shikhobalov. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 231-233.

7 ref. (Q25, 1-52, 17-56)

601-Q. (Russian.) **Use of Partitioned Sieve to Study Effect of Stress on Plastic Deformation of Steel.** I. A. Razov and E. M. Shevandin. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 317-324.

7 ref. (Q24, 3-66; ST)

602-Q. (Russian.) **Fatigue Tests and Durability of Metals.** S. V. Serensen, V. P. Kogaev, M. N. Stepnov and E. V. Giatsintov. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 324-329.

10 ref. (Q7)

603-Q. (Russian.) **Determination of Resistance of Steel Parts to Buckling Under High Temperatures.** M. P. Markovets and V. P. Tret'yakov. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 329-330.

Alloys offer greater resistance to buckling than steel at temperatures of 700 to 800°. (Q28, 6-62; ST)

604-Q. (Russian.) **Determination of Endurance Limits of Mild Steels and Alloys.** N. M. Rudnitskii. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 331-332.

4 ref. (Q7, 1-54; ST)

605-Q. (Russian.) **Testing Cohesive Strength of Bimetallic Antifriction Coating to the Base Metal.** Yu. Ya. Zil'berg. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 335-338.

(Q10c, L17)

606-Q.* **New Steel for Aircraft and Missiles.** *British Steelmaker,* v. 24, Mar. 1958, p. 77-79.

Armco PH 15-7 Mo, a new and higher strength precipitation hardening stainless steel, possesses an outstanding combination of room-temperature and elevated-temperature mechanical properties. It is readily fabricated in the annealed condition, can be hardened by low-temperature heat treatments with minimum distortion, and exhibits good corrosion resistance. (Q-general, 2-62, T24; SS)

607-Q. Percussion Drill Steel Life. Pt. 1. What Are the Factors? Lloyd E. Antonides. *Engineering and Mining Journal,* v. 158, Nov. 1957, p. 90-97.

Ways to combat failure of drill rods caused by fatigue in surface layers from tension stresses. 26 ref. (Q7, W28; TS)

608-Q.* **Ductile Stainless Work Hardens for Extra Strength.** *Iron Age,* v. 181, May 29, 1958, p. 88-89.

New, nitrogen-containing stainless work hardens but has better ductility than Type 301. Produced in sheet and strip, it has a wide range of application in the extra-full-hard condition. (Q23a, Q23p; SS, *N*)

609-Q. Structural Problems in Hypersonic Flight. Samuel B. Batdorf. *Jet Propulsion,* v. 27, Nov. 1957, p. 1157-1161.

12 ref. (Q25, Q-general; T24a)

610-Q.* **Creep, Stress-Relaxation, and Metallurgical Properties of Steels for Steam-Power Plant Operating With Steam Temperatures Above 950° F. (510° C.)** A. I. Smith, E. A. Jenkinson, D. J. Armstrong and M. F. Day. Digest from ASME Annual Meeting, Paper 57-A-225, Oct. 1, 1958. *Mechanical Engineering,* v. 80, Mar. 1958, p. 112-113.

Steels investigated were types suitable for turbine casing bolts, steam pipes, superheater tubes and cast components. They included Mo-V, Cr-Mo-V, Cr-Mo, and Cr-Ni-Cb (18-12-1). Methods of manufacture, chemical analyses, heat treatments and mechanical properties. (Q3m, Q-general, 2-62; AY, SS)

611-Q.* **Creep Properties of Austenitic Nickel: Chromium Steels Containing Niobium.** W. H. Bailey, M. G. Gemmill, H. W. Kirkby, J. D. Murray, E. A. Jenkinson and A. I. Smith. Digest from ASME Annual Meeting, Paper 57-A-254, Oct. 1, 1958. *Mechanical Engineering,* v. 80, Mar. 1958, p. 113.

Data relate to 16 heats of steel. On a rupture basis, the tests extend up to 8000 hr. at 1022° F., 42,000 hr. at 1202° F., 26,000 hr. at 1292° F., and 20,000 hr. at 1382° F. On the basis of 1% plastic strain data extend up to 32,000 hr. at 1112° F., 30,000 hr. at 1202° F., 12,000 hr. at 1292° F., and 14,000 hr. at 1382° F. Tests relate to wrought bars of small diameter (⅝ to 1 in.) and to a rotor forging. (Q3m, SS)

612-Q.* **Croloy 15-15N. An Austenitic Heat-Resistant Alloy for Severe Tubular Applications at Elevated Temperatures.** J. F. Ewing. Digest from ASME Annual Meeting, Paper 57-A-205, Oct. 1, 1958. *Mechanical Engineering,* v. 80, Mar. 1958, p. 113-114.

New alloy was developed for applications requiring strength properties in the 1200-1500° F. range. Chemical composition of Croloy 15-15N is similar to AISI Type 316 (16 Cr, 13 Ni, 3 Mo). Tungsten together with Mo and Cb-Ta has been added to a 15 Cr-15 Ni base for strengthening. Short-time tensile, creep-rupture, and creep properties of Croloy 15-15N. (Q3, Q27; SS)

613-Q.* **Concentrated Wear of Turning Tools.** V. Solaja. *Research,* v. 11, Apr. 1958, p. 152-156.

Concentrated tool wear in the form of grooves at boundaries of contact between tool and workpiece; effect of groove formation on surface finish; causes of concentrated tool wear, relation to fatigue. 24 ref. (Q9, T6n)

614-Q.* **On the Contact Resistance Between Surface-Oxidized Metals in Repeated Sliding.** Yasukatsu Tamai. *Wear,* v. 1, Apr. 1958, p. 377-383.

Steel and copper studied under

natural and surface-oxidized conditions. With steel the trace of contact resistance during sliding fluctuated in both cases, but with Cu it was either smooth or fluctuating under natural or oxidized condition, respectively. Influence of oxygen content in the atmosphere on the nature of the oxide layer was also studied with tin. 4 ref. (Q9p; ST, Cu)

615-Q.* Report on Papers on Wear Presented at the Institution of Mechanical Engineers Conference. F. T. Barwell. *Wear*, v. 1, Apr. 1958, p. 418-445.

Discussion of conclusions reached in 40 papers read at the conference on lubrication and wear, London, England, October 1957. Subjects include wear, test methods, surface films, effect of temperature and environment, fretting and wear in engines. 10 ref. (Q9)

616-Q. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Pt. 7. Long Period Fatigue Tests on a Ferritic and an Austenitic Steel at 500-650° C. Max Hempel. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 311-316. (Iron and Steel Institute Translation no. 574.)

Previously abstracted from original. See item 964-Q, 1957. (Q3, Q7, 2-62; AY, SGA-h)

617-Q. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Pt. 2. Procedure for Analysis. Gerhard Bandel and Henning Gravenhorst. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 253-258. (Iron and Steel Institute Translation no. 587.)

Previously abstracted from original. See item 960-Q, 1957. (Q3, 1-54)

618-Q. Solution of Some Problems of Fatigue Strength by the Step-Test Method. Hans Buhler and Walter Schreiber. *Archiv für das Eisenhüttenwesen*, v. 28, Mar. 1957, p. 153-156. (Iron and Steel Institute Translation no. 588.)

Previously abstracted from original. See item 719-Q, 1957. (Q7e, Q25k; ST)

619-Q. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Pt. 3. Results of Creep Tests on Ferritic Tube Steels. Eduard Jahn. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 259-267. (Iron and Steel Institute Translation no. 593.)

Previously abstracted from original. See item 961-Q, 1957. (Q3, 1-54, 1-60; AY)

620-Q. Vapor Pressure Experiments on Fe-Cr Alloys. Karl Bungardt. *Archiv für das Eisenhüttenwesen*, v. 27, Nov. 1956, p. 715-724. (Iron and Steel Institute Translation no. 618.)

Previously abstracted from original. See item 238-Q, 1957. (Q22, 1-53, P12c, Fe, *Cr*)

621-Q. Effects of Nitrogen Linkage With Aluminum on the Properties of Steels. Hans J. Wiester. *Stahl und Eisen*, v. 77, June 13, 1957, p. 773-784. (Iron and Steel Institute Translation no. 643.)

Previously abstracted from original. See item 721-Q, 1957. (Q-general, M27c, 2-60; ST, SGB-a, *N, Al*)

622-Q. The Tendency of Steels to Brittle Fracture, as a Function of the Stress State and Temperatures. Albert Kochendorfer and Herbert Scholl. *Stahl und Eisen*, v. 77, July 25, 1957, p. 1006-1018. (Iron and Steel Institute Translation no. 646.)

Previously abstracted from original. See item 828-Q, 1957. (Q26s, Q6, 1-54; ST)

623-Q. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Organization and Conduct of Tests. Helmut Reiner. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 247-252. (Iron and Steel Institute Translation no. 673.)

Previously abstracted from original. See item 959-Q, 1957. (Q3, 1-53, 1-54, 1-60)

624-Q. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Pt. 4. Results of Creep Tests on Ferritic Engineering Steels. Helmut Holdt. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 269-285. (Iron and Steel Institute Translation no. 574.)

Previously abstracted from original. See item. 962-Q, 1957. (Q3, 2-62, 2-60; AY)

625-Q. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Pt. 5. Results of Creep Tests on Austenitic Steels and Alloys. Karl Bungardt. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 287-304. (Iron and Steel Institute Translation no. 675.)

Previously abstracted from original. See item 963-Q, 1957. (Q3, 2-62, 2-60; AY)

626-Q. Behavior of Heat Resisting Steels During Creep Testing at 500-700° C. Pt. 8. Some Preliminary Deductions. Rudolf Schinn. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 317-323. (Iron and Steel Institute Translation no. 677.)

Previously abstracted from original. See item 695-Q, 1957. (Q3m, 2-62; ST)

627-Q. 100,000 Hr. Creep Tests at 500° C. on Various Types of Steel. August Thum. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 325-337. (Iron and Steel Institute Translation no. 747.)

Previously abstracted from original. See item 966-Q, 1957. (Q3, 1-54; AY)

628-Q. On the Conversion of Creep Values to Other Temperatures. Alfred Krisch and Wolfgang Wepner. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 339-344. (Iron and Steel Institute Translation no. 748.)

Previously abstracted from original. See item 967-Q, 1957. (Q3, 1-54)

629-Q. Mechanical Properties of Some Ultra High Strength Steels. I. V. Paisov and Zo Yun Kho. *Metallovedenie i Obrabotka Metallov*, Feb. 1958, p. 2-6. (Henry Brutcher, Altadena, Calif., Translation no. 4140.)

The addition of tungsten to Cromansil steel increases its impact strength and resilience and makes it more suitable for machine parts. 6 ref. (Q-general, Q6, Q21, 2-60; AY, *Cr, Mn, Si, W*)

630-Q. Stress-Rupture Strength of Welds at High Temperature. A. V. Stanyukovich and V. K. Zemzin. *Metallovedenie i Obrabotka Metallov*, Feb. 1958, p. 12-18. (Henry Brutcher, Altadena, Calif., Translation no. 4147.)

(Q3m, 2-62; ST, 7-51)

631-Q. (English.) **Internal Friction and Imperfections in Copper.** D. H. Niblett and J. Wilks. *Bulletin de l'Institut International du Froid*, Supplement, Sept. 1956, p. 23-30.

Recent measurements on cold worked Cu and the information they reveal regarding behavior of both dislocations and point defects. 7 ref. (Q22, M26s; Cu)

632-Q.* (English.) Scratch Hardness. Pt. 1. Relation to Cold Working. Tomiya Sutoki and Takeo Hikage. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 10, Apr. 1958, p. 85-96.

Scratch hardness was measured on single crystals and polycrystals of several metals. When the metal was cold worked, the change in the scratch width was very small, whereas indentation hardness conspicuously changed. Scratch hardness was considered to be related rather to the annealed state than to the extremely worked state of a metal. 6 ref. (Q29d, 3-68)

633-Q.* (English.) Young's Modulus and Grain Size in Nickel-Copper Alloys. Yuki Shirakawa and Ken'ichi Numakura. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 10, Apr. 1958, p. 110-119.

Young's modulus and the grain size have been measured in ten specimens of polycrystalline ferromagnetic Ni-Cu alloys annealed at 700, 800, 900, 1000 and 1100° C. With the addition of Cu, Young's modulus of Ni with comparatively small grains increased, whereas that with comparatively large grains decreased. (Q21a, M27c, 2-60; Ni, *Cu*)

634-Q. (French.) **High-Temperature Steels and Alloys.** P. Villian. *Metallurgie et la Construction Mecanique*, v. 90, May 1958, p. 345, 347-349, 351, 353, 355, 357-358.

Properties and high-temperature behavior of Fe-Cr, Fe-Ni-Cr and Ni-Cr alloys. (Q-general, 2-62; SS, SGA-h)

635-Q.* (German.) Torsion Fatigue Strength of Some Heat Treating Steels After Inductive Surface Hardening. Franz Bollenrath. *Archiv für das Eisenhüttenwesen*, v. 28, Dec. 1957, p. 801-806.

Structure, Vickers hardness and torsion fatigue strength were tested over the entire cross section of specimen. Depth of hardening was from 0.16 to 3.5 mm. Fatigue strength rises with increasing depth. At depths up to 2.2 mm. however, the fatigue strength is lower than after annealing without surface hardening. 11 ref. (Q7h, 2-64; ST)

636-Q.* (German.) Observation on the Velocity of Sound in Iron-Chromium-Carbon Alloys. Alfred Fiedler. *Archiv für das Eisenhüttenwesen*, v. 28, Dec. 1957, p. 825-830.

Measurements on the velocity of sound were carried out on some Fe-Cr-C alloys by means of the supersonic-impulse-echo-method (water-interferometer). Results show a definite relation between sound velocity and carbon content. Formation of carbides and heat treatment seem to be of strong influence. 6 ref. (Q21f; Fe, *Cr*)

637-Q. (German.) **Importance of the Elastic Properties of Spheroidal Graphite Cast Iron in the Construction of Machines.** Cornelio Gianola. *Giesserei*, v. 45, Apr. 24, 1958, p. 210-219.

4 ref. (Q21a, Q21b, Q23; CI-r)

638-Q. (German.) **Construction, Method of Use and Range of Applicability of a New Bend Test Apparatus.** Walter Köhler. *Werkstoffe und Korrosion*, v. 9, Apr. 1958, p. 216-227.

28 ref. (Q5, 1-53)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

639-Q.* (German.) **Influence of Alloying Additives on the Friction Properties of Sintered Copper.** Wilhelm Hofmann and Gerhard Pieper. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 80-86.

A special testing fixture for radial pressure application was designed. Friction forces were recorded and wear was determined gravimetrically and related to friction energy. Sintering pressure and temperature have no influence. Additions such as Sn, Zn, Fe and clay resulted in considerable wear and a high noise level. Raising Pb content decreased the noise. Copper-graphite specimens showed small wear, low noise levels and uniform friction constants. 16 ref. (Q9p, H15; Cu, 6-72)

640-Q.* (German.) **Mechanical Properties of Lead Alloys.** Erich Pelzel. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 102-110.

Mechanical properties of Pb-Sb alloys, such as tensile strength, ultimate strain, hardness and the influence of alloying elements such as Sn, Sn-As, Cu, Ni, Bi, Cd, Li and Te. Age hardening effects of the various components. 9 ref. (Q-general, 2-60, N7a; Pb, *Sb*)

641-Q. (Japanese.) **Severe Wear of Pearlitic Steel Weld Metal.** Sukemitu Ito, Kozo Honda and Kikuzo Ishiyama. *Journal of Mechanical Laboratory,* v. 12, Mar. 1958, p. 52-59.

Relationship between wear and microstructure; microscopic examination of wearing surfaces. 8 ref. (Q9n, M27; ST, 7-51)

642-Q.* (Portuguese.) **Study on Radial Compression Strength of Porous Bronze Gaskets.** Vincente Mazzarella. *ABM, Boletim da Associacao Brasileira de Metais,* v. 14, Jan. 1958, p. 63-93.

Correlation of limit of resistance to radial compression of gaskets with particle size of Cu, molding pressure, sintering temperature and Sn content. 13 ref. (Q28g, H-general; Cu)

643-Q. (Russian.) **Heat Resistance of Austenitic Steels During Cyclic Temperature Changes.** *Metallovedenie i Obrabotka Metallov,* Feb. 1958, p. 38-49.

Study of various factors, particularly effect of alternating temperatures, on failure of gas turbine blades. Creep rate of austenitic steel blades at 982° is 7 times as great under alternating as compared to stable temperatures. 15 ref. (Q-general, Q3, T7h, 2-61; AY)

644-Q. (Russian.) **Effect of Internal Stresses on Inclusion Formation.** I. E. Brainin, V. A. Kharchenko and A. I. Kondrashov. *Stal',* v. 18, Apr. 1958, p. 342-348.

Effect of internal stresses in steel forgings on inclusion formation, caused by joint action of hydrogen and tensile stresses—mechanical, thermal and structural. 13 ref. (Q25, F22, 9-69; ST, *H*)

645-Q. (Russian.) **Method of Testing Nontwisting Wire Cables.** M. F. Glushko. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 211-213.

(Q27, 1-54, T7g)

646-Q. (Russian.) **Determination of Cohesive Strength and Fatigue Limit of Thin Electrolytic Antifriction Coatings.** G. G. Gugunishvili. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 333-335.

(Q10c, Q7a; 8-12)

647-Q. (Pamphlet.) **Large Fatigue Testing Machines and Their Results.** *American Society for Testing Materials, Special Technical Publication* no. 216, 1958, 162 p., $4.25.

Symposium presented at Atlantic City in June 1957. Papers on fretting corrosion of large shafts, fatigue tests of large alloy steel shafts, sudden fracture of machine parts and determination of dynamical loading in fatigue tests. (Q7, 1-53)

Corrosion R

299-R. Corrosion—What Causes It and How It Happens. Pt. 1. W. A. Koehler. *American Gas Journal,* v. 185, Mar. 1958, p. 24-25.

(R1)

300-R. Development of a Cubic Oxide Protective Film on Zirconium. James R. Johnson. *AIME Transactions,* v. 212, Feb. 1958, p. 13-14.

Cubic ZrO_2 is more stable to neutron damage than monoclinic ZrO_2. Small additions of other oxides with ZrO_2 were reacted at 1500° C. and the amounts of cubic phase formed, if any, were determined by X-ray diffraction. Columbium appears to be the most promising alloy for development. (R1h, P18; Zr)

301-R. Zirconium and Titanium Inhibit Corrosion and Mass Transfer of Steels by Liquid Heavy Metals. O. F. Kammerer, J. R. Weeks, J. Sadofsky, W. E. Miller and D. H. Gurinsky. *AIME Transactions,* v. 212, Feb. 1958, p. 20-25.

Zirconium and titanium inhibit solution mass transfer of steels by liquid Bi, Hg and Pb. Bi and Hg absorb on the surface of the steels and subsequently react with nitrogen and possibly carbon to form inert, adherent surface layers of ZrN, TiN, or TiN + TiC. Conditions under which these deposits form. 16 ref. (R2a, R10b; ST, *Zr, Ti*)

302-R.* Corrosion Mechanism of Uranium-Base Alloys in High Temperature Water. M. W. Burkart and B. Lustman. *AIME Transactions,* v. 212, Feb. 1958, p. 26-30.

Uranium-base alloys exposed to high-temperature water fail either by uniform oxidation or by sudden cracking and disintegration. Disintegration results from the oxidation of a second phase which is precipitated during the corrosion process. The precipitate has been identified as a metastable hydride. 9 ref. (R4, 2-62; U-b)

303-R.* Prolonged Oxidation of Zirconium at 350 and 450° C. Robert G. Charles, Sidney Barnartt and Earl A. Gulbransen. *AIME Transactions,* v. 212, Feb. 1958, p. 101.

Reaction of Zr with oxygen at 1 atm. pressure was followed at 350 and 450° C. for 500 and 200 hr., respectively. Extrapolation of short-term oxidation data for Zr to obtain the long-term behavior is best done through the cubic equation $w^3 = k_c t$ + constant. 5 ref. (R1h; Zr)

304-R.* Oxidation Rate of Molybdenum in Air. E. S. Bartlett and D. N. Williams. *AIME Transactions,* v. 212, Apr. 1958, p. 280.

Values at temperatures from 1400 to 2150° F. (R1h, 2-61; Mo)

305-R.* Oxidation of Zircaloy-2 and 3A at 300 to 850° C. E. A. Gulbransen and K. F. Andrew. *AIME Transactions,* v. 212, Apr. 1958, p. 281-286.

From 500 to 750° C. the alloys oxidized at a faster rate than pure Zr while below 500° C. the pure metal reacted at a faster rate. The cubic-rate law fits the data best for the abraded specimens. Rate data for chemically polished specimens show a good fit to the parabolic-rate law. 19 ref. (R1h; Zr-b)

306-R.* Intergranular Corrosion Resistance of Austenitic Stainless Steels. A Ferric Sulfate-Sulfuric Acid Test. Michael A. Streicher. *ASTM Bulletin,* no. 229, Apr. 1958, p. 77-86.

A specific test for determining intergranular attack on chromium carbide precipitation in unstabilized steels. Samples are exposed to boiling 50% sulphuric acid and ferric sulphate for 120 hr. Comparison of two specimens—annealed (resistant to attack) and sensitized (heated 1 hr. at 1250° F.) gives difference between general and integranular corrosion. 19 ref. (R11, R2h; SS-e)

307-R. Corrosion and the Destination of Corrosion Products in a High Pressure Power Plant. Ross C. Tucker. *Corrosion,* v. 14, May 1958, p. 19-22.

Water conditioning, feedwater and steam concentrations, corrosion of steam lines, turbine blade deposits, the collecting of dissolved gases in condensers and dissolved oxygen scavengers. 9 ref. (R4c, W11k)

308-R.* Cathodic Protection of Lead Cable Sheath in the Presence of Alkali From Deicing Salts. Walter H. Bruckner and W. W. Lichtenberger. *Corrosion,* v. 14, Apr. 1958, p. 165t-170t.

Potential gradient tests provide information on effects of salt concentration, pH and potential on corrosion behavior of lead when partially and fully immersed. Criteria for effective cathodic protection are different for portions of lead cathodes below and above the water line. Conditions at the air solution interface require a more negative voltage for protection than below the interface. (R10d, T1b; Pb)

309-R. Basic Concepts and Practical Aspects of Field Corrosion Investigation. Maurice A. Riordan. *Corrosion,* v. 14, Apr. 1958, p. 171t-174t.

Relates electrical measurements to corrosion characteristics of structural metal systems in soil or water. (R4, R8)

310-R.* An Electrical Resistance Method of Corrosion Monitoring in Refinery Equipment. A. J. Freedman, E. S. Troscinski and A. Dravnieks. *Corrosion,* v. 14, Apr. 1958, p. 175t-178t.

Corrosion decreases cross section and consequently the electrical conductivity of metal specimens exposed to refinery fluids at high temperature and in inaccessible locations. Rate of corrosion determined by increase in resistance. Technique successfully used many conditions of temperature and pressure in vapor and liquid phases with both oil and aqueous media. Allows rapid quantitative determination of corrosion rate and evaluation of effect of operating procedure in corrosion inhibitors. 6 ref. (R11a, R7a)

311-R.* High Temperature Oxidation of Iron-Nickel Alloys. M. J. Brabers and C. E. Birchenall. *Corrosion,* v. 14, Apr. 1958, p. 179t-182t.

Alloys containing 15 to 89% Ni were oxidized in oxygen in brief stages at 1050° C., and equilibrated in argon atmosphere between stages and following oxidation. Metallographic, X-ray diffraction and chemical investigation indicated subscale formed preferentially at grain boundaries. Porosity developed in subscale regions during equilibration, then began to sinter out on longer heating. Clarifies features of iron-rich corner of ternary phase diagram. Structure and composition of wustite and spinel in subscale and outer scale and relative growth rates of these phases. 18 ref. (R1h, M24c; Fe, Ni, O)

312-R.* Controlling Corrosion in Coal-Chemical Plants. C. P. Larrabee and W. L. Mathay. *Corrosion,* v. 14, Apr. 1958, p. 183t-186t.

Resistance of carbon steel, galvanized steel, copper steel, types 304, 316 and 410 stainless steels to corrosive environment in coal chemical plant. Corrosion and surface tests with coal handling equipment, primary coolers, ammonia saturators, light oil recovery equipment and tar stills. 9 ref. (R7d; CN, AY, SS)

313-R.* Reaction of Certain Chlorinated Hydrocarbons With Aluminum. A. C. Hamstead, G. B. Elder and J. C. Canterbury. *Corrosion,* v. 14, Apr. 1958, p. 189t-190t.

Type 3003 Al transfer line failed after handling refined propylene dichloride for a few hours. Laboratory investigation of nature and rate of reaction between Al and propylene dichloride. (R7g; Al)

314-R.* Statistical Concepts in the Testing of Corrosion Inhibitors. C. C. Nathan and E. Eisner. *Corrosion,* v. 14, Apr. 1958, p. 193t-199t.

Static and dynamic corrosion tests with both synthetic fluids and actual fluids from producing oil wells. Fluctuation in weight losses of steel test coupons; variation in rate of attack with concentration of organic adsorption type inhibitors. Statistical analysis of data. 17 ref. (R10b, S12, R7a; ST)

315-R.* Cathodic Protection of Iron in the Temperature Range 25 C—92 C. G. R. Hoey and M. Cohen. *Corrosion,* v. 14, Apr. 1958, p. 200t-202t.

Fluctuations in corrosion rate of iron specimens immersed in sodium chloride solutions observed for various current densities and temperatures. Cathodic polarization curves for iron in 110-ppm. sodium chloride solutions. Corrosion products analyzed by X-ray. Limiting protective current density and open circuit cathodic current density went through temperature maximum at approximately 75° C. Unsteady potentials observed in vicinity of limiting protective current. Current density at which the potential of the iron reaches minus 0.5 volt on the hydrogen scale gave satisfactory potentials. 16 ref. (R10d; Fe)

316-R.* Corrosion Rates of Mild Steel in NH_4NO_3-H_2O Solutions. Norman Hackerman, Ray M. Hurd and Earl S. Snavely. *Corrosion,* v. 14, Apr. 1958, p. 203t-205t.

Corrosion rates of SAE 1021 steel in mixture of ammonium nitrate, ammonia and water were measured at temperatures of 30, 45 and 60° C. Effectiveness of thiocyanate, thourea, 2-mercapto-ethanol and sodium arsenite in inhibiting corrosion. Completely stress-relieved coupons would not corrode. Rate of uninhibited reaction much lower at 45 and 60° C. than at 30° C. 6 ref. (R7j, R10b, 3-66; CN)

317-R.* Effects of Cold Working on Corrosion of High Purity Aluminum in Water at High Temperatures. M. J. Lavigne. *Corrosion,* v. 14, May 1958, p. 226t-228t.

In distilled water at 100° C., high-purity Al cold worked 5 to 50% and all the recrystallized Al samples corrode intergranularly, but materials cold-worked 60% and over are immune. 5 ref. (R4, 2-62, R2h, 3-68; Al-a)

318-R. Methods for Increasing the Corrosion Resistance of Metal Alloys. N. D. Tomashov. *Corrosion,* v. 14, May 1958, p. 229t-236t.

With corrosion controlled by oxygen diffusion, cathodic inclusions do not notably accelerate corrosion. When it is possible to establish prevalent anodic control, cathodic inclusions may promote passivation and consequently considerably reduce the rate of corrosion. 56 ref. (R10d)

319-R.* Corrosion of Zinc by Differential Aeration. G. Bianchi. *Corrosion,* v. 14, May 1958, p. 245t-248t.

Corrosion in molar NaCl solutions under varying conditions of aeration, pH and test time. Formation of differential aeration macrocells is due to passivity of Zn on the zones of the specimen where cathodic reduction of oxygen takes place. The principal process of corrosion is accompanied by local corrosion processes at the cathodic and anodic areas of the macrocell. 4 ref. (R6j, R10c, Zn)

320-R.* The Mechanism of Stress Corrosion of Austenitic Stainless Steels in Hot Aqueous Chloride Solutions. K. W. Leu and J. N. Helle. *Corrosion,* v. 14, May 1958, p. 249t-254t.

Investigation proves that the initial corrosive attack is dependent primarily on the mechanical and chemical behavior of the passivating film already present on the steel or formed during exposure to the corrosive medium and only to a minor extent on the structure of the metal itself. 11 ref. (R1d, R6j; SS)

321-R.* The Acetic Acid Salt Spray Test. J. H. Hooper. *Institute of Metal Finishing, Bulletin,* v. 8, Spring 1958, p. 79-90.

Relative merit of 1% acetic acid, 5% salt spray tests and other accelerated tests. Found 24-hr. sulphur dioxide test most suitable for Cr-Ni and Cr-Ni-Cu plating on steel; hot or cold acetic acid tests for similar coatings on Zn or brass; hot acetic acid method for anodized high-purity Al. No correlation was found between results with straight 5% salt spray tests and corrosion occurring under atmospheric exposure. 8 ref. (R11j; ST, Zn, Cu, Al, 8-12)

322-R. Relationship Betwen Magnesium Content and Stress-Corrosion Susceptibility of Aluminium-Magnesium Alloys. W. J. Vance. *Journal of Applied Chemistry,* v. 8, Jan. 1958, p. 18-23.

15 ref. (R1d, 2-60, Al, *Mg*)

323-R. Corrosion in High-Purity Water. *Metal Industry,* v. 92, Apr. 25, 1958, p. 330-333.

(R4e; Ni, Al)

324-R.* Accelerated High Temperature Oxidation Due to Vanadium Pentoxide. K. Sachs. *Metallurgia,* v. 57, Apr. 1958, p. 167-173.

How vanadium pentoxide increases oxidation of Ni, Ni alloys, steel, stainless steel, aluminium bronze and other metals when exposed to high-temperature air or oxygen. Fluxing effect of vanadium pentoxide and resultant increase in diffusion of metal and oxide ion through the protective oxide films. Chemical attack and other secondary effects. Importance of vanadium pentoxide in fuel ash of gas turbines. (To be continued.) 41 ref. (R7d, R1h; Ni, ST, SS, Cu-s)

325-R.* Corrosion of Lead-Base Babbitt Metal. C. I. R. McDougall and E. Klar. *Ontario Hydro Research News,* v. 9, July-Sept. 1957, p. 19-22, 26.

Alloys No. 7 and 8 with 5 and 10% Sn resisted corrosion under all conditions. Alloy No. 15 with 1% Sn resisted corrosion under most circumstances, even when in contact with highly acidic oil. However, when water was present in same oil, a very marked interaction was evident, oil deteriorated rapidly and babbitt surface was corroded. (R7e; Pb, *Sn,* SGA-c)

326-R.* Atmospheric Exposure Tests of Different Types of Electrodeposited Nickel. J. Edwards. *Product Finishing,* v. 11, Mar. 1958, p. 58-66.

Resistance to corrosion in industrial and marine environments of Ni deposited from sulphate-chloride solutions is virtually independent of the additions made to the baths in order to promote brightening, leveling, low stress and so on. This is true whether or not the deposit has a top coat of Cr, provided that the quality of the Cr on different types of Ni undercoat is the same. 7 ref. (R3n, R3p; *Ni,* 8-62)

327-R. Corrosion Properties of Various Materials in High Temperature Waters. C. J. Lancaster. U. S. Naval Engineering Experiment Station. *U. S. Office of Technical Services,* PB 121503, June 1953, 24 p. $.75.

(R4, 2-62)

328-R. The Stress Corrosion and Pyrophoric Behavior of Titanium and Titanium Alloys. D. W. Stough, F. W. Fink and R. S. Peoples. Battelle Memorial Institute. (Office of Assistant Secretary of Defense for Research and Engineering.) *U. S. Office of Technical Services,* PB 121635, Sept. 1957, 56 p. $1.50.

Review. (R1e, P13; Ti)

329-R. Progress Report on the Salt Corrosion of Titanium Alloys at Elevated Temperature and Stress. Battelle Memorial Institute. *U. S. Office of Technical Services,* PB 121637, Nov. 1957, 57 p. $1.50.

(R6g, 2-62, 3-66; Ti-b)

330-R. Pitting in Ferrous Systems: An Annotated Bibliography. M. Benton. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131006, June 1957, 129 p. $3.25.

(R2j; Fe, ST; 11-65)

331-R. Development of a Corrosion Resistant Magnesium Alloy. Pt. 1, 2. M. Balicki, D. D'Antonio, A. Kravic, and V. P. Siuta. Polytechnic Institute. (Wright Air Development Cen-

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

ter.) *U. S. Office of Technical Services,* PB 131443, 131444; Aug. 1957, 2 v., 89 p. $2.50.

Novel scheme to improve corrosion resistance of Mg by alloying with elements with lower surface tensions. Preliminary results indicate that alloys containing Sb, Ge, In, Sn and Cd improved corrosion resistance.
(R10g, 2-60; Mg-b, *Ge, In, Sb, Sn*)

332-R. Determination of Intergranular Corrosion by Measuring the Internal Friction. M. A. Vedeneeva. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 64-67. (Henry Brutcher, Altadena, Calif., Translation no. 4099.)

(R2h, Q22, 154; SS, ST)

333-R. On the Oxidation of Tungsten at High Temperatures. V. I. Arkharov and Yu. D. Zozmanov. *Fizika Metallov I Metallovedenie,* v. 2, no. 2, 1956, p. 361-369. (Henry Brutcher, Altadena, Calif., Translation no. 4104.)

Previously abstracted from original. See item 405-R, 1956.
(R1h; W)

334-R. Effect of Water Vapor Concentration on the Corrosion of Metals by Chlorine. Kh. L. Tseitlin and V. A. Strunkin. *Journal of Applied Chemistry of the USSR,* v. 29, no. 11, (1957), p. 1793-1800. (Translation by Consultants Bureau, Inc.)

7 ref. (R6g)

335-R. Elemento-Organic Compounds of the Fifth Group of Mendeleev's Periodic System as Inhibitors of Acid Corrosion. S. A. Balezin and M. A. Ignatyeva. *Journal of Applied Chemistry of the USSR,* v. 29, no. 11, (1957), p. 1777-1784. (Translation by Consultants Bureau, Inc.)

Effects of organic compounds containing P, As, Sb and Bi on solution rate of steel in acids in relation to the concentrations of acid and inhibition. 6 ref. (R10b; ST)

336-R. (English.) Effect of Cathodic Protection on the Corrosion Fatigue of Mild Steel. Yoshio Minami. *Sixth Japan National Congress for Applied Mechanics, Proceedings,* Mar. 1957, p. 69-70.

(R1e, R10d; CN)

337-R. (French.) Economics of Cathodic Protection of Conduits. G. Fauvel. *Corrosion et Anticorrosion,* v. 5, Nov. 1957, p. 331-338.

(R10d; 4-60)

338-R. (French.) Corrosion of Type 18/8 Stainless Steel: Causes and Prevention. J. Dedieu and L. Pennec. *Corrosion et Anticorrosion,* v. 5, Nov. 1957, p. 348-358.

5 ref. (R-general, SS)

339-R. (French.) Oil Industry Fights Corrosion. J. Tourret. *Metallurgie et Construction Mecanique,* v. 90, Apr. 1958, p. 285-289.

(R-generàl, T29n)

340-R. (French.) Passivity of Stainless Steel in Sulphuric Acid. Effect of Heat Treatment Between 1050° and 650° and of Cold Forming. Carl Carius. *Métaux Corrosion-Industries,* v. 33, Jan. 1958, p. 6-29.

(R6g, R10c, 2-64, 3-64; SS)

341-R.* (French.) Long-Term Corrosion Tests on Painted Steel Exposed to Atmosphere. Paul Nylen. *Peintures, Pigments, Vernis,* v. 34, Mar. 1958, p. 116-117.

Corrosion Committee of Royal Academy of Sciences of Sweden has, since 1938, carried out several series of extended tests on plates painted with different types of paints and exposed to atmosphere in various parts of Sweden. Results are reported in terms of influence of climate and nature of paint on intrusion of rust. (R3; ST, 8-70)

342-R.* (French.) Effect of Low-Temperature Stress Relieving on Stress-Corrosion Cracking. C. R. McKinsey. *Revue de la Soudure,* v. 14, no. 1, 1958, p. 42-48.

Welded structures are susceptible to stress-corrosion because of the residual stresses that are generally present. A series of tests for determining the effect of low-temperature stress relieving on the stress-corrosion of arc butt welded steel plates showed that stress-corrosion increases with decrease in carbon content and that controlled relieving at low temperature reduces susceptibility of welded plates to stress-corrosion. 11 ref.
(R1d, J1a; ST, 7-51)

343-R.* (German.) Effect of Small Additions of Antimony on Oxidation Velocity of Lead. Helmut Hartmann, Wilhelm Hofmann and Wolfgang Stahl. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 11, Apr. 1958, p. 151-163.

Preliminary experiments at 350-500° on tarnishing velocity. Gravimetric determination of oxidation velocity at 600 and 750° and explanation of its results according to the scaling theory. Surface tension is dependent on Sb content.
(R2q, R2r, 2-60; Pb, *Sb*)

344-R.* (Italian.) Biological Corrosion in a Hydro-Electric Plant in Africa and Role of Organic Products in the Corrosion Process. Pierre Coulomb. *Vernici,* v. 14, Jan. 1958, p. 69-71.

Corrosion behavior of standard bituminous coatings in installation in Belgian Congo. Factors included aggressivity of waters and abundant deposits of sludge. However, no bacteria of known corrosive action were found in sludge. Harmful action of sludge was therefore attributed to presence of aminic acids and bases, as revealed by chemical analysis and chromatography. Presence of these materials also explains unexpected resistance to corrosion of some red lead paints.
(R1g, L26a)

345-R. Influence of Bicarbonate Ion on Inhibition of Corrosion by Sodium Silicate in a Zinc-Iron System. Henry L. Shuldener and Leo Lehrman. *American Water Works Association, Journal,* v. 49, Nov. 1957, p. 1432-1440.

21 ref. (R10b; Zn, Fe)

346-R.* Fretting Corrosion of Cast Iron. F. T. Barwell and K. H. R. Wright. *British Cast Iron Research Association, Journal of Research and Development,* v. 7, Apr. 1958, p. 190-202.

Fretting behavior of 12 different cast iron surfaces investigated under seven conditions of lubrication, including the dry condition. Lubricated specimens in the as-cast condition are less susceptible to fretting than annealed specimens. Liquid lubricants appear to be slightly more effective than greases.
(R1f; CI, NM-h)

347-R.* The Influence of Silicon Content on the Growth and Scaling Resistance of Cast Iron With Nodular Graphite. R. J. Maitland and I. C. H. Hughes. *British Cast Iron Research Association, Journal of Research and Development,* v. 7, Apr. 1958, p. 203-223.

Growth and scaling behavior of nodular irons with 1.2 to 5.7% Si at temperatures within the range 650 to 1000° C. Both growth and scaling proceed relatively slowly and are inhibited by increasing Si contents at temperatures below the austenite transformation range. When the critical temperature range is exceeded or nearly exceeded, growth and scaling become excessive and seem to be promoted by Si. 21 ref. (R2q, 2-60; CI-r, *Si*)

348-R.* The Corrosion Resistant Properties of Zirconium. Pt. 1. F. G. Cox. *Corrosion Prevention and Control,* v. 5, Apr. 1958, p. 39-42.

Purity of Zr affects its corrosion resistance. Low-carbon (0.04%) Zr metal is attacked by HF concentrated H_2SO_4, and solutions of $FeCl_3$ and $CuCl_2$; and is resistant to HCl, H_3PO_4, dilute H_2SO_4 and alkalies. Special alloys, developed for high-temperature use with water. (To be continued.) (R6, 64; Zr)

349-R. The Protection of Overhead Electric Conductors. J. A. Airey. *Corrosion Prevention and Control,* v. 5, Apr. 1958, p. 44-45.

Special coating developed to protect electrical power transmission cables from corrosion, especially in coastal areas. (R3, T1b, L26p)

350-R. An Accelerated Corrosion Test Chamber. W. Hess. *Corrosion Prevention and Control,* v. 5, Apr. 1958, p. 47-51.

Test chamber allowing for atmospheric conditions contains a transparent enclosure, test agents admitted as aerosols and humidity and temperature control features.
(R11j, R3, 1-53)

351-R. The Protection of Motor Vehicles From Corrosion. *Corrosion Prevention and Control,* v. 5, Apr. 1958, p. 52, 54, 73.

The combination of sodium benzoate and sodium nitrite have been effective corrosion inhibitors in automobile radiators with or without ethylene-gylcol antifreeze. Automobile mufflers may be protected from corrosion by the use of Zn-coated steels or Zn paints. Al alloy parts are lighter and anodized parts are effective for trims.
(R10b, T21c, L16, L26; Al-b)

352-R. Surface Protection of Austenitic 16% Chromium, 14% Nickel Steel From Intergranular Corrosion. Yu. N. Griboyedov. *Metallovedenie i Obrabotka Metallov,* Mar. 1958, p. 42-48. (Henry Brutcher, Altadena, Calif., Translation no. 4176.)

Protection of steel by surface decarburization in hydrogen atmosphere. Techniques; optimal composition of atmosphere. Effect of long-term aging on the tendency to corrosion; mechanical properties of decarburized steel.
(R2h, R10c; SS)

353-R. (Czech.) Resistance of Materials to Corrosive Media. Alois Zapletalek. *Zvaranie,* v. 7, Apr. 1958, p. 102-109.

Physical conditions for rendering materials resistant to corrosive media encountered in the chemical industry. Examples of corrosion arising under conditions other than those encountered in the chemical industry. 4 ref. (R6, R7, R10)

354-R. (French.) Classification of Cast Iron Qualities According to Its Resistance at Various Temperatures. Pierre Détrez. *Fonderie,* v. 146, Mar. 1958, p. 136-142.

Resistance to corrosion, and chemical composition of pearlitic cast iron. (R-general, 2-61; CI)

355-R. (German.) **Electrochemical Investigations of Pure Titanium and of Alloy TiMo30.** O. Rudiger and R. W. Fischer. *Technische Mittelingen Krupp,* v. 15, no. 7, Dec. 1957, p. 194-202.

Corrosion resistance of Ti is result of the titanium dioxide—titanium hydride layer. Measurement of potential provides the means of studying formation and dissolution of protective layers. 10 ref. (R11m; Ti, *Mo*)

356-R. (Russian.) **Micro-Electric Chemical Method for Study of Corrosion of Metal Under Stress.** A. V. Ryabchenkov, V. M. Nikiforova and V. F. Abramova. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 167-173.

(R11s)

357-R. (Russian.) **Investigation of Corrosion and Electro-Chemical Processes in Metals by Means of Ionizing Radiation.** I. L. Rosenfel'd and E. K. Oshe. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 346-348.

(R11a, S19)

358-R. Corrosion of Air Pipelines. German Methods of Protecting Steel. Franz Eisenstecken. *Iron and Coal Trades Review,* v. 175, Dec. 20, 1957, p. 1423-1424.

(R10b, 4-60; ST)

359-R.* **Accelerated High Temperature Oxidation Due to Vanadium Pentoxides. Pt. 2.** K. Sachs. *Metallurgia,* v. 57, May 1958, p. 224-232.

Residual oils from the distillation of crude oils are rich in a corrosive ash, which may clog up a gas turbine and attack metal components operating at high temperatures. Phenomenon attributed to the vanadium pentoxide in the ash, either alone or in combination with other substances. A variety of methods suggested for overcoming the problem. 41 ref. (R1h, R7d; SS)

360-R.* **Lab Inhibitor Stops DEA Corrosion.** J. D. Sudbury, O. L. Riggs and J. F. Leterie. *Petroleum Refiner,* v. 37, May 1958, p. 183-184.

Corrosion studies of alkanolamine systems revealed a peculiar type of thread-like corrosion called filiform corrosion. New inhibitor controls it in laboratory tests. (R10b, R7f)

361-R. (English.) **Cargo Space Corrosion in Tanker Ships.** W. G. Richards. *Teknisk Ukeblad,* v. 104, Oct. 24, 1957, p. 869-874.

Methods for overcoming severe corrosion of cargo tanks exposed to white or black petroleum products. 16 ref. (R4b, R7d, T26q; ST)

362-R. Structure of Scale on Hot Rolled Strips and Sheets. Walter Fackert. *Stahl und Eisen,* v. 76, Dec. 15, 1958, p. 1705-1710. (Iron and Steel Institute Translation no. 589.)

Previously abstracted from original. See item 87-R, 1956. (R2q, F23; ST)

363-R.* (French.) **Influence of Hemp Cores on Corrosion of Metal Cables.** *STZ, Bohler Stahl,* v. 54, May 2, 1958, p. 392-397.

Chlorides, particularly sodium chloride, present in hemp are major cause of internal corrosion of steel cables if not kept well greased. Wash with distilled water is effective treatment for removal of sodium chloride before fabrication of cable. (R6j, T7g; ST)

364-R.* (German.) **The "Supertemperature" Which Appears During Scaling of Pure Iron and Its Theoretical Explanation.** Norbert G. Schmahl, Hans Baumann and Hermann Schenck. *Archiv für das Eisenhüttenwesen,* v. 29, Jan. 1958, p. 41-46.

"Supertemperature" is defined as the excess temperature of the specimen over the ambient temperature of furnace. Through new experiments a mathematical description of the temperature curve in dependence of time was made possible. A graphic method permits the determination of the constant of heat transfer and the temperature of the specimen. 10 ref. (R2q, P11k; Fe-a)

365-R. (German.) **Comparative Inhibiting Effect of Organic Compounds in Aqueous Solutions.** W. Funke and K. Hamann. *Werkstoffe und Korrosion,* v. 9, Apr. 1958, p. 202-216.

Protective effect of a number of organic compounds on steel sheet. 35 ref. (R10b; ST, 4-53, NM-b)

366-R.* (German.) **Corrosion of Distillery Equipment.** Dietmar Plottner. *Werkstoffe und Korrosion,* v. 9, May 1958, p. 261-262.

Copper is especially sensitive to hydrogen sulphide and a considerable quantity of grayish black copper sulphide accumulates in the receptacle of a Cu still. (R7k, T29; Cu)

367-R.* (German.) **Survey of Polish Publications on Accelerated Corrosion Tests of Electroplated Coatings to Determine Their Resistance to Corrosion.** Tadeusz Biestek. *Werkstoffe und Korrosion,* v. 9, May 1958, p. 271-273.

Salt spray test, immersion tests in distilled water, in ammonium chloride solutions and in artificial industrial atmospheres. Accelerated tests of phosphate coatings on steel. 11 ref. (R11j; ST, 8-12)

368-R.* (German.) **High-Temperature Corrosion by Hydrogen Sulphide—Experiments Made in Petroleum Refining.** Peter W. Sherwood. *Werkstoffe und Korrosion,* v. 9, May 1958, p. 273-277.

Attack causes loss of metal and formation of large crusts which block the passages and impede the transfer of heat. Type of crusts depends on the sort of steel used. High Cr-Ni alloys proved to be good except at high temperatures. For practical use 18-8 Cr-Ni steel has sufficient resistance. 6 ref. (R7k, 2-62; SS)

369-R.* (German.) **Investigations Into the Stress-Corrosion of Alpha Brass in Ammonia Vapor. Pt. 3. A Method for Testing the Stress-Corrosion Susceptibility of Brass Pieces Under the Influence of Ammonia.** F. Aebi. *Zeitschrift für Metallkunde,* v. 49, Feb. 1958, p. 63-68.

Susceptibility of brass to season cracking is caused by development of ammonia from various origins. The conventional mercury test is unsatisfactory, because brass behaves differently in the presence of ammonia. A new testing method with ammonia was developed, which permits the correct observation of ammonia concentration and temperature. (R1d, R7j; Cu-n)

370-R.* (Italian.) **Caustic Cracking of Mild Boiler Steel. Pt. 1. Theories on Cause and Nature of This Phenomenon.** Nello Collari and Piero Virdis. *Calore,* v. 29, Feb. 1958, p. 47-57.

Pros and cons of theories based on (1) internal pressure exercised by hydrogen or hydrocarbides, (2) intergranular precipitation of iron oxides and azides, (3) formation of oxide film, (4) mechanical causes such as permanent deformation, stresses, (5) distortion of intergranular boundaries. 26 ref. (R2h, T26q; CN)

371-R. (Russian.) **Method for Study of Inertness on Metal Surfaces.** I. D. Tomashov, G. P. Chernova, R. M. Al'tovskii and G. K. Blinchevskii. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 299-303.

Electrochemical method for cleaning and studying metal surfaces under 30% solution of H_2SO_4. (R11m, R6g, L13n)

372-R.* (Pamphlet.) **Corrosion and Its Prevention.** 1958 Edition. 25 p. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. $.75.

Corrosion as it affects air conditioning and refrigeration industry. Atmospheric, water circuit corrosion, refrigerant circuit corrosion and industry practice and recommendations for combating corrosion. 8 ref. (R-general, W 10g)

373-R. (Book.) **1954-1955 Bibliographic Survey of Corrosion.** A. Irene Humphrey. *National Association of Corrosion Engineers,* no. 58-1, 1958, 468 p. $20.

(R-general, 11-65)

8 Inspection and Control

267-S. Improved Vacuum-Fusion Method for the Determination of Oxygen and Nitrogen in Metals. Nev A. Gokcen. *AIME Transactions,* v. 212, Feb. 1958, p. 93-100.

Construction and operation of a simple and accurate vacuum-fusion apparatus. Limits of interference of Mn, Al, and Ti, and the effects of Sn and water-cooling of the furnace tube have been investigated in detail. 73 ref. (S11r)

268-S. Ultrasonics—the Key to Locating Defects in Metal Structure. Robert N. Hafemeister. *Allis-Chalmers Electrical Review,* v. 22, no. 4, 1957, p. 20-24.

(S13g)

269-S. The Absorptiometric Determination of Traces of Iron in Bismuth. E. Booth and T. W. Evett. *Analyst,* v. 83, Feb. 1958, p. 80-82.

7 ref. (S11; Bi, *Fe*)

270-S.* **Micro Procedure for the Electrolytic Determination of Lead in Copper-Base Alloys.** H. C. J. Saint. *Analyst,* v. 83, Feb. 1958, p. 88-92.

Conditions affecting the electrolytic deposition of micro-amounts of lead as peroxide in Cu-base alloys, particularly brass. 5 ref. (S11g, Cu-b, *Pb*)

271-S. The Spectrophotometric Determination of Nickel in Copper-Nickel Alloys. G. R. Sutcliffe and D. M. Peake. *Analyst,* v. 83, Mar. 1958, p. 122-125.

The optical density of the sample solution in a nitric-phosphoric acid medium is measured at 3950 Å, where absorption is due almost entirely to Ni. A similar measurement is made on the same solution at 4900 Å, where neither Cu nor Ni absorb, and this permits a background correction to be made. Method applied to copper alloys with Ni content from about 1.5 to 30%; a single determination can be com-

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

pleted in about 30 min., as opposed to 3 hr. by gravimetric procedure. (S11k; *Ni*, Cu-b)

272-S. Volumetric Determination of Uranium in Presence of Iron. M. W. Desai and T. K. S. Murthy. *Analyst*, v. 83, Mar. 1958, p. 126-129.

Oxidation of reduced uranium with ferric sulphate and titration of the excess of ferric iron iodimetrically. Osmium tetroxide is a suitable catalyst. 11 ref. (S11j; *Fe*, U)

273-S. A Spectrochemical Solution Method for the Determination of Copper, Cobalt and Iron in Copper and Cobalt Concentrates. G. L. Mason and Z. De Beer. *Analyst*, v. 83, Mar. 1958, p. 129-135.

A solution method of spectrochemical analysis of Cu and Fe in Cu and Co concentrates over the range 5.0 to 40.0%, and 0.2 to 6.0% Co. Results show good agreement with chemical analyses, but reproducibility varies, according to the element and its concentration. The time for one analysis is 1 hr., and 20 samples can be analyzed. 10 ref. (S11k; Cu, Fe, Co)

274-S. Analysis of Rare Earth Mixtures by a Recording Spectrophotometer. D. C. Stewart and Dorothy Kato. *Analytical Chemistry*, v. 30, Feb. 1958, p. 164-172.

Multiple tracing light absorption curves of the rare earth chlorides in solution (except lanthanum, promethium and lutecium), taken with the Beckman DK recording spectrophotometer, permit direct evaluation of interferences. 9 ref. (S11a; EG-g)

275-S. X-Ray Fluorescent Spectrometric Determination of Yttrium in Rare Earth Mixtures. Robert H. Heidel and Velmer A. Fassel. *Analytical Chemistry*, v. 30, Feb. 1958, p. 176-179.

10 ref. (S11p; *Y*, EG-g)

276-S. Emission Spectrometric Determination of Oxygen in Titanium and Titanium Alloys. Velmer A. Fassel and William A. Gordon. *Analytical Chemistry*, v. 30, Feb. 1958, p. 179-182.

Method based on the direct current carbon arc excitation of a special electrode assembly which provides a molten platinum bath after arc is initiated. 17 ref. (S11; Ti, *O*)

277-S. Automatic Determination of Uranium in Process Streams. H. W. Bertram, M. W. Lerner, G. J. Petretic, E. S. Roszkowski and C. J. Podden. *Analytical Chemistry*, v. 30, Feb. 1958, p. 354-359.

An automatic instrument composed of a derivative polarograph and a sampling and proportioning system. The derivative polarograph, based upon the resistance-capacitance circuit, scans the applied voltage in a reverse direction to decrease peak oscillations. Concentrations of uranium are recorded at 5-min. intervals. Factors affecting the precision and accuracy are briefly discussed. 13 ref. (S11m, S18q, 1-52; U)

278-S. Photometric Determination of Chromium in Electronic Nickel. C. L. Luke. *Analytical Chemistry*, v. 30, Mar. 1958, p. 359-361.

Determination of 0.001 to 0.02% Cr in Ni. Chromium is oxidized to the sexivalent state, Ni is removed by precipitation as nickel ammonium perchlorate, and the chromate in the filtrate is determined by the photometric diphenylcarbazide method. (S11a; *Cr*, Ni)

279-S. Volumetric Determination of Magnesium in Titanium. M. J. Miles, W. J. Mesimer and Mae Atkin. *Analytical Chemistry*, v. 30, Mar. 1958, p. 361-363.

8 ref. (S11j; *Mg*, Ti)

280-S. Determination of Oxygen in Titanium-Modified Vacuum Fusion Apparatus and Platinum Bath Technique. S. J. Bennett and L. C. Covington. *Analytical Chemistry*, v. 30, Mar. 1958, p. 363-365.

7 ref. (S11r; Pt, Ti-b, *O*)

281-S. Rare Earths in Purified Thorium and Uranium Preparations. Chemical Isolation and Spectrographic Determination. Cyrus Feldman and Janus Y. Ellenburg. *Analytical Chemistry*, v. 30, Mar. 1958, p. 418-422.

10 ref. (S11k; *EG-g*, Th, U)

282-S. Coulometric Reduction of Oxides on Tin Plate. Robert P. Frankenthal, Thomas J. Butler and Raymond T. Davis, Jr. *Analytical Chemistry*, v. 30, Mar. 1958, p. 441-443.

11 ref. (S11g; *O*, Sn, 8-65)

283-S.* Determination of Rare Earth Impurities in Thorium by Spectrographic Methods. L. W. Wray. *Atomic Energy of Canada Limited*, AECL no. 546, Aug. 1957, 26 p.

Before spectrographic examination the impurities are freed from the thorium matrix by removing the bulk of the Th by extraction with TBP-CCl_4 and the remainder by extraction with TTA-C_6H_6. This results in a consistent recovery of rare earths of about 85% with an average sensitivity of 0.2 ppm. 16 ref. (S11k; Th, EG-g, 9-51)

284-S. Determination of Rare Earth Impurities in Thorium by Spectrographic Methods. L. W. Wray. *Atomic Energy of Canada Limited*, CRDC-742, Aug. 1957, 14 p.

16 ref. (S11k; Th, EG-g, 9-51)

285-S. Analytical Chemistry of Copper and Alloys. *Chemical Age*, v. 79, Feb. 1958, p. 317-318.

19 ref. (S11; Cu)

286-S. Plating Test Determines Degree of Cleanliness of Wire Surfaces. Merton Allen. *Insulation*, v. 4, Mar. 1958, p. 10-11.

12 ref. (S15, 4-61)

287-S. X-Rays Will Measure "Blind" Dimensions Accurately. *Iron Age*, v. 181, May 15, 1958, p. 78-80.

(S14e)

288-S. Nondestructive Testing of Steel Castings for Elevated Temperature Service. *Mechanical Engineering*, v. 80, Apr. 1958, p. 66-70.

14 ref. (S13; SGA-h, ST, 5-60)

289-S. Vacuum-Fusion Analysis for Oxygen in Titanium. W. R. Hansen, M. W. Mallett and M. J. Trzeciak. Battelle Memorial Institute. *U. S. Office of Technical Services*, PB 121638, Dec. 1957, 28 p. · $.75.

(S11r; Ti, *O*)

290-S. Development of a Nondestructive Test for Evaluation of Adhesion of Electrodeposits on Steel as in Silver-Plated Aircraft Bearings. A. L. Walters and S. A. Wenk. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131226, Nov. 1953, 65 p.

Ultrasonic method. (S13g, L17; *Ag*, ST)

291-S. The Direct Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys Using Bromine Trifluoride. Armour Research Foundation. (Watertown Arsenal.) *U. S. Office of Technical Services*, PB 131290, Jan. 1957, 16 p. $.50.

(S11r; Ti, *O*)

292-S. Research and Development Leading to the Establishment of Ultrasonic Test Standards for Aircraft Materials. A. D. Guinn, R. D. McKown, J. C. Folz and W. C. Hitt. Ultrasonic Testing and Research Laboratory, Wright Air Development Center. *U. S. Office of Technical Services*, PB 131564, Oct. 1957, 133 p. $3.50.

(S13g, S22, T24)

293-S. Effective Thickness of Chromium Plate on the Sensitivity of Magnetic Particle Inspection. W. Steindorf and B. Cohen. Wright Air Development Center. *U. S. Office of Technical Services*, PB 131608, Oct. 1957, 13 p. $.50.

Plate thickness of 4.5 mils was established as a practical limitation for effective crack detection. (S13j; ST, *Cr*, 8-62)

294-S. Reactor Fabrication Demands New Quality Control Methods. R. E. Lorentz. *Western Metalworking*, v. 16, Apr. 1958, p. 53.

(S12, T26q, W11p; SS)

295-S. Automatic Electromagnetic and Ultrasonic Inspection of Steel Billets. V. Husarek. *Stahl und Eisen*, v. 77, no. 21, 1957, p. 1483-1487. (Henry Brutcher, Altadena, Calif., Translation no. 4110.)

Previously abstracted from original. See item 33-S, 1958. (S13g, S13h, CN-g; 4-52, 4-55)

296-S. Determination of Oxygen in Pig and Cast Irons. H. Goto. *Tetsu to Hagane*, v. 42, no. 1, 1956, p. 49-52. (Henry Brutcher, Altadena, Calif., Translation no. 4112.)

Application of fractional vacuum-fusion method to the determination of the separate oxides. (S11g; CI, *O*)

297-S. Analysis of Steel for Gases by the Vacuum-Heating Method. Yu. A. Klyachko. *Zavodskaya Laboratoriya*, v. 23, no. 12, 1957, p. 1410-1412. (Henry Brutcher, Altadena, Calif., Translation no. 4130.)

(S11r; ST)

298-S. Taking Samples From Semifinished Steel for Hydrogen Analysis. A. N. Morozov. *Zavodskaya Laboratoriya*, v. 22, No. 7, 1956, p. 867-869. (Henry Brutcher, Altadena, Calif., Translation no. 4131.)

S11; *H*, ST)

299-S. Comparative Evaluation of Methods for Determining Gases in Steel. Yu. A. Klyachkov, L. L. Kunin and E. M. Chistyakova. *Zavodskaya Laboratoriya*, v. 23, no. 8, 1957, p. 905-907. (Henry Brutcher, Altadena, Calif., Translation no. 4133.)

Previously abstracted from original. See item 68-S, 1958. (S11r; ST)

300-S. Relation Between Permeability of Rolling-Stock Axles to Ultrasound and Properties of Steel. H. Nakamura and R. Inoue. *Tetsu to Hagane*, v. 43, no. 9, 1957, p. 1074-1076. (Henry Brutcher, Altadena, Calif., Translation no. 4159.)

Difficulties encountered in the ultrasonic testing of rolling-stock components of intrinsically low permeability to ultrasound. (S13g, T7j)

301-S. Ultrasonic Inspection of Steel Slabs. Pt. 1. Y. Sasaki. *Tetsu to Hagane*, v. 43, no. 9, 1957, p. 1073-1074. (Henry Brutcher, Altadena, Calif., Translation no. 4160.)

New apparatus and procedure for speedy scanning. (S13g; ST, 5-59)

302-S. New Process for Sampling Killed and Rimming Steel for Determination of Oxygen and Hydrogen. Hermann Schenk, Karl Heinz Gerdom and Klaus-Gunther Schmitz. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 123-125. (Iron and Steel Institute Translation no. 630.)

Previously abstracted from original. See item 366-S, 1957.
(S12h, S11r, 1-53; ST, *O, H*)

303-S. Research on the Hydrogen Analysis of Iron and Steel by Low Pressure and Constant Volume Method. Toyosuke Tanoue, Munezo Matsuba and Shunsuke Inoue. *Sumitomo Metals,* v. 8, Oct. 1956, p. 255-260. (Iron and Steel Institute Translation no. 687.)

Previously abstracted from original. See item 105-S, 1957.
(S11r; Fe, ST, *H*)

304-S. Contribution to the Study of the Analytical Behavior of Nitrides in Steels. P. Tyou. *Revue Universelle des Mines, de la Mecanique, de la Metallurgie,* v. 99, Dec. 1956, p. 641-652. (Iron and Steel Institute Translation no. 722.)

Previously abstracted from original. See item 104-S, 1957.
(S11; ST, N, 14-8)

305-S. Sensitive Determination of Carbon With a Recording Conductivity Instrument. Walter Koch and Hanns Malissa. *Archiv für das Eisenhüttenwesen,* v. 27, Nov. 1956, p. 695-700. (Iron and Steel Institute Translation no. 773.)

Previously abstracted from original. See item 80-S, 1957.
(S11g; ST, CI, *C*)

306-S. Some Considerations on the Interpretation of Ultrasonic Tests Used for Discovering Defects in Steel. E. Marianeschi and T. Tili. *Metallurgia Italiana,* v. 49, Apr. 1957, p. 275-289. (Iron and Steel Institute Translation no. 896.)

Previously abstracted from original. See item 310-S, 1957.
(S13g; ST)

307-S. (French.) **Determination of Carbon in Steels by Means of Combustion and Conductometry.** R. Boulin. *Chimie Analytique,* v. 40, Mar. 1958, p. 72-76.

6 ref. (S11g; ST, *C*)

308-S. (French.) **Electrolytic Determination of Tin Deposits on Copper Wires.** Robert Hourquin. *Cuivres-Laitons-Alliages,* no. 42, Mar-Apr. 1958, p. 33-35.

(S14c, Cu, Sn, 4-61, 8-65)

309-S. (French.) **Research on Surface Roughness After Machining.** l'Abbe Cayere. *Machine Moderne,* v. 52, Apr. 1958, p. 41-51.

(S15, G17)

310-S. (French.) **Spectral Analysis of Metals. Apparatus Used; Spectroscopes, Spectrographs, Direct-Reading Spectrometers.** *Machine Moderne,* v. 52, Apr. 1958, p. 67-79.

(Concluded.) (S11k, 1-53)

311-S. (French.) **Image Quality in the Radiography of Heavy Sections of Steel Using High-Energy Radiation.** G. Chanty and E. Mencarelli. *Revue de Metallurgie,* v. 55, Mar. 1958, p. 218-226.

Exposure needed and the image quality obtained in the radiography of steel over 100 mm. thick using high-energy radiation sources. Comparison between results obtained and those given for the same thicknesses of steel, either 100 or 200 mm. by cobalt-60 radiation in terms of both exposure time and image quality. 9 ref. (S13e; ST)

312-S. (German.) **Determination of Magnesium in Aluminum.** H. Birtel. *Aluminium,* v. 34, Apr. 1958, p. 207-208.

5 ref. (S11j, Al, *Mg*)

313-S. (German.) **Some Basic Principles for Quality Standardization of Spur-Gears.** H. Weinhold. *Fertigungstechnik,* v. 8, Feb. 1958, p. 80-92.

8 ref. (S12, T7a)

314-S. (German.) **Influence of Test Specimen Preparation Upon the Chemical Analysis of Gray Cast Iron.** Herbert Auerbach. *Giessereitechnik,* v. 4, Feb. 1958, p. 35-37.

3 ref. (S11, 1-60; CI)

315-S. (German.) **Trends and Developments in the Use of Heat Measurement and Regulating Apparatus in Ironworks.** Hans Weineck. *Stahl und Eisen,* v. 78, Apr. 17, 1958, p. 494-505.

Measuring and regulating equipment in large capacity pusher-type heating furnaces; safety controls, effects on production and costs, choice of auxiliary power.
(S16, X-9; ST)

316-S. (German.) **A New Method for Measuring Wall Thickness and Sound Velocity.** Ludwig Niklas. *Zeitschrift für Metallkunde,* v. 49, Mar. 1958, p. 152-155.

Supersonic echo measuring method. (S14g)

317-S. (Japanese.) **Rapid Spectrochemical Analysis of Silicon in Molten Steel.** Yutaka Terauchi. *Sumitomo Metals,* v. 9, Oct. 1957, p. 221-230.

13 ref. (S11k, X21; ST, *Si*)

318-S. Determination of Very Small Amounts of Carbon in Metals. Robert E. Fryxell. *Analytical Chemistry,* v. 30, Jan. 1958, p. 273-275.

Controlling the combustion temperature with a variable transformer significantly improves precision of measurement. 7 ref. (S11m; C)

319-S. Chemical Analysis of Cupola Slags. Pt. 2. Determination of Calcium and Magnesium Oxides. W. E. Clarke. *British Cast Iron Research Association, Journal of Research and Development,* v. 7, Apr. 1958, p. 249-256.

18 ref. (S11j, E10a; CI, RM-q)

320-S. Nondestructive Testing. C. B. Jenni. *Mechanical Engineering,* v. 80, Apr. 1958, p. 66-70.

Visual examination, radiography, magnetic particle examination and ultrasonic inspection. Techniques, applications, practical hints. (S13)

321-S. Determination of Oxygen in Titanium by the Micro Bromination Method. Mitsunao Takahashi, Makoto Kawane and Tetsuo Mitsui. *Mikrochimica Acta,* no. 5, Jan. 1957, p. 647-657.

18 ref. (S11d; *O*, Ti)

322-S. Inclusions in Uranium Metal. K. E. G. Meredith and M. B. Waldron. *United Kingdom Atomic Energy Authority, A.E.R.E.* M/M 156, 1957, 16 p.

Precise differentiation of the precipitates formed by the U-Fe, U-Si and U-Al compounds is not always possible. Uranium hydride and calcium or magnesium fluoride can be identified with fair certainty when in sufficient quantity. 39 ref.
(S11; U, 9-69)

323-S. Self-Imposed Welding Standards. *Welding Engineer,* v. 43, Apr. 1958, p. 54, 56, 59.

(S22, K-general)

324-S. (French.) **Fast, Simple Method of Analyzing Antifriction Metals.** M. E. Garate and M. T. Garate. *Chimie Analytique,* v. 40, Mar. 1958, p. 77-79.

(S11; Cu, Pb, Sb, Sn, SGA-c)

325-S. (German.) **Separation of Rare Earths. Pt. 4. Separation of Rare Earths With Cation Exchangers.** Leopold Werner and Joachim Massonne. *Journal für Praktische Chemie,* v. 5, Oct. 1957, p. 14-20.

(S11f; EG-g)

326-S.* (German.) **Determination of Chromium (III) Content of Chromium Bath and of Other Solutions Containing Chromic Acid.** R. Weiner and E. Ney. *Metallwaren-Industrie und Galvanotechnik,* v. 49, Apr. 1958, p. 140-143.

Origin of trivalent Cr in electrolytic baths. Chromium (III) content as criterion of correct operating. Disadvantages of gravimetric and usual titrometric methods. Modern complexometric method and its technique in the presence of chromic acid and in its absence.
(S11; *Cr,* L17a)

327-S. (German.) **Nondestructive Testing of Wire Rope.** Eugen Hanke. *Neue Hütte,* v. 3, Mar. 1958, p. 173-179.

Literature review. Methods using alternating current—absolute and comparative measuring, measuring of radial component. Methods using direct current—absolute measuring, oscillating spool method, measuring of radial component. Advantages and disadvantages of various methods. (26 ref. (S13, 4-61)

328-S. (German.) **Supersonic Testing of Welds.** W. H. Papke. *Schweissen und Schneiden,* v. 10, Apr. 1958, p. 131-135.

Impulse-echo method. (S13g; 7-51)

329-S. (German.) **Spectrochemical Determination of Columbium and Titanium in Tantalic Acid.** K. Jordan and K. Picard. *Technische Mitteilungen Krupp,* v. 15, no. 7, Dec. 1957, p. 203-207.

13 ref. (S11; Cb, Ti, Ta)

330-S.* (Japanese.) **The Cathode Ray Tube Type Ultrasonic Thickness Gage and Its Application to Nondestructive Inspection.** Noboru Niwa. *University of Tokyo, Institute of Industrial Science, Report,* v. 7, Feb. 1958, 67 p.

Thickness measurement of plates and tubes of steel, Al and Cu, Pb sheath of cable; corrosion inspection of tank walls and high-pressure gas vessels; detection of lamination and other flaws in thin metal plates; inspection of contact surface of two metal plates. (S14g, S13, X20c)

331-S. (Rumanian.) **Rational Analysis of Lead, Copper and Zinc Ores.** M. Ionescu and Roman Pavel. *Revista Minelor,* v. 9, Jan. 1958, p. 39-44.

(S11; Cu, Pb, Zn, RM-n)

332-S. (Russian.) **Determination of Copper With Aid of Lead Diethyldithiocarbanate.** S. E. Kreimer and L. P. Butylkin. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 131-133.

(S11j; *Cu*)

333-S. (Russian.) **Amperometric Determination of Molybdenum and Tungsten in Presence of Nickel.** A. K. Babko and A. I. Volkova. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 135-137.

6 ref. (S11j; *Mo, W, Ni*)

334-S. (Russian.) **Amperometric Titration of Cobalt With Potassium Ferrocyanide.** A. K. Zhdanov, V. A. Khadeev and G. P. Moiseeva. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 137-140.

6 ref. (S11j; *Co*)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

335-S. (Russian.) **Amperometric Determination of Cobalt in Magnetic Alloys.** V. F. Toronova and O. S. Strekalova. *Zavodskaya Laboratoriya,* v.24, Feb. 1958, p. 140-141.

(S11j; *Co,* SGA-n)

336-S. (Russian.) **Colorimetric Determination of Titanium in Alloy Steel.** A. I. Lazarev and V. I. Lazareva. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 145-146.

(S11a; *Ti,* AY)

337-S. (Russian.) **Development of the Analytical Method of Amperometric Titration.** O. A. Songina. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 160-166.

General review of literature in USSR and abroad with emphasis on application of method to metallurgy. 93 ref. (S11j)

338-S. (Russian.) **Capacity Test for Determination of Thickness of Varnish Coating on Metals.** I. L. Rosenfel'd and Yu. P. Ol'khovnikov. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 173-176.

(S14c; 8-70)

339-S. (Russian.) **Determination of Cobalt and Cadmium in Pure Nickel.** S. E. Kreimer, N. V. Tuzhilina, V. A. Golovina and R. A. Tyabina. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 262-264.

Advantages in use of solution of diontipirilmethane and ammonium thiocyanate as against the colorimetric method. 5 ref.
(S11a, S11j; *Cd, Co,* Ni-a)

340-S. (Russian.) **Colorimetric Determination of Copper in Nickel Electrolytes.** A. N. Busev, M. I. Ivanyutin and Y. M. Feigina. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 265-266.

(S11a; *Cu,* Ni)

341-S. (Russian.) **Volumetric Determination of Gallium by Vanadium Atometric Method.** S. Ya. Vinkovetskaya and V. A. Nazarenko. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 268-270.

9 ref. (S11j; *Ga*)

342-S. (Russian.) **Microtensiometric Determination of Silver With Aid of Triazole.** L. N. Lomakina, N. I. Tarasevich and P. K. Agasyan. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 270-273.

5 ref. (S11d; *Ag*)

343-S. (Russian.) **Colorimetric Determination of Selenium and Tellurium in Lead Dust.** V. P. Gladyshev. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 275-278.

7 ref. (S11a; Pb, *Se, Te*)

344-S. (Russian.) **Determination of Indium in Sphalerite Concentrates by Amperometric Titration.** B. S. Tsyvina and V. M. Vladimirova. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 278-280.

6 ref. (S11j; *In,* RM-n)

345-S. (Russian.) **Radiometric Titration of Zinc and Cadmium With Potassium Ferrocyanide.** I. M. Gibalo and V. M. Byr'ko. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 281-283.

5 ref. (S11j; Cd, Zn)

346-S. (Russian.) **Electro-Induction Device for Disclosing Fissures in Parts of Nonmagnetic Alloys.** L. N. Suvorov. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 354-356.

(S13c, 1-53)

347-S.* **Should Ultrasonic Inspection Be Used to Augment Radiography in the Inspection of Weldments in High-Pressure Piping.** R. L. Steele. Digest from ASME Annual Meeting, Paper 57-A-195, Oct. 1, 1958. *Mechanical Engineering,* v. 80, Mar. 1958, p. 111-112.

Root cracks cannot be detected satisfactorily by radiography even though a radiograph of the root pass is made. Ultrasonic inspection locates the crack positively. Ultrasonic inspection of field welds is also satisfactory. A possible crack was detected, which was very small, that was in no way indicated on the radiograph of the same joint.
(S13g, S13e; 7-51)

348-S.* **Composite Procedure for the Determination of Mo, Ni, Mn, Fe, Cr, Sn, V and N in Titanium Alloys.** George Norwitz and Maurice Codell. *Metallurgia,* v. 57, May 1958, p. 261-267, 269-270.

Nickel is determined colorimetrically or gravimetrically with dimethylglyoxime; Mn is determined by the periodate colorimetric method, or by titration with arsenite; Fe is determined colorimetrically or by titration; Cr is determined colorimetrically with diphenylcarbazide, or by titration with ferrous sulphate; nitrogen is determined volumetrically. 40 ref. (S11; Ti, *Mo, Ni, Mn, Fe, Cr, Sn, V, N*)

349-S. Separation and Determination of the Platinum Metals on a Microscale. A. D. Westland and F. E. Beamish. *Mikrochimica Acta,* no. 5, 1957, p. 620-639.

21 ref. (S11d; EG-c, Pt)

350-S. Method of Precipitation at Constant pH of Hydrated Oxides: Principle and Applications in Micro-Analysis of Chromium and Molybdenum. Motoharu Tanaka. *Mikrochimica Acta,* no. 2, Jan. 20, 1958, p. 204-211.

16 ref. (S11d; Cr, Fe, Mn, Mo)

351-S. Ultrasonic Testing of Sheets. Herman Josef Kopineck. *Stahl und Eisen,* v. 77, May 30, 1957, p. 727-734. (Iron and Steel Institute Translation no. 666.)

Previously abstracted from original. See item 322-S, 1957.
(S13g; ST, 4-53.)

352-S. (English.) **A New Photometric Determination of Microquantity of Antimony Using Fuchsin or Malachite Green.** Hidehiro Goto and Yachiyo Kakita. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 10, Apr. 1958, p. 103-109.

(S11a; Sb)

353-S. (French.) **Magnetic Methods for Detection of Impurities in Solids.** L. Weil. *Bulletin de l'Institut International du Froid,* Supplement, Sept. 1956, p. 77-82.

6 ref. (S13h)

354-S. (French.) **Microdetermination of Aluminum in Calcium.** Helen Ostertag and Yvette Cappelliez. *Comptes Rendus,* v. 246, Mar. 10, 1958, p. 1550-1553.

6 ref. (S11d; *Al,* Ca)

355-S. (German.) **Micro-Analytical Investigations in Iron Research. Pt. 3. Handling of Microgram Quantities in Metallurgical Research.** Walter Koch, Hanns Malissa and Dagmar Ditges. *Archiv für das Eisenhüttenwesen,* v. 28, Dec. 1957, p. 785-794.

(S11d)

356-S. (German.) **Separation of Difficult to Dissolve Precipitations in Highly Dilute Solutions.** Carl Mahr and Horst Klamberg. *Archiv für das Eisenhuttenwesen,* v. 28, Dec. 1957, p. 795-800.

15 ref.
(S11a, S11d; Cd, Co, Fe, Ni, Pb)

357-S. (German.) **Experiences With Flame Spectrometry for Determination of Calcium and Magnesium in Steel Laboratories.** Karl Abresch and Walter Dobner. *Archiv für das Eisenhüttenwesen,* v. 29, Jan. 1958, p. 25-34.

24 ref. (S11k; ST, *Ca, Mg*)

358-S. (German.) **Contribution Toward the Rapid Analysis of Blast Furnace Slags.** Alfred Neuberger, Ernst Schoffmann and Karl Herkenhoff. *Archiv für das Eisenhüttenwesen,* v. 29, Jan. 1958, p. 35-39.

29 ref.
(S11a; *Ca, Fe, Mg, Mn, Si,* RM-q)

359-S. (Portuguese.) **Chemical Analysis of Tin Solders.** Venancio Ferreira Alves and Alfonso Buccheri. *ABM, Boletim da Associacao Brasileira de Metais,* v. 14, Jan. 1958, p. 139-148.

6 ref. (S11; Pb, Sb, Sn, SGA-f)

360-S. (Russian.) **Trilonometric Determination of Iron in Ores and Agglomerates.** N. G. Fesenko. *Zavodskaya Laboratoriya,* Jan. 1958, p. 25-26.

6 ref. (S11j; *Fe,* RM-n)

361-S. (Russian.) **Determination of Boiler Plate Quality.** V. I. Dorokhov, A. V. Lopatin and V. A. Molotkov. *Stal',* v. 18, Apr. 1958, p. 348-352.

(S13d; CN, 4-53)

362-S. (Russian.) **Determination of Antimony in Purified Lead.** Yu. Yu. Lur'e and T. V. Zaglodina. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 133-134.

(S11a; Pb, *Sb*)

363-S. (Russian.) **Ultrasonic Testing of Adhesion of Babbitt to Bearings.** L. M. Yablonik. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 176-178.

(S13g, Q10c, T7d; Sn, 8-65)

364-S. (Russian.) **Determination of Copper, Bismuth, Antimony, Lead and Tin in Ferrotungsten.** N. M. Kostyanovskay and M. V. Babaev. *Zavodskaya Laboratoriya,* v. 24, Feb. 1958, p. 254-255.

(S11; *Bi, Cu, Fe, Pb, Sb, Sn,* W, AD-n31)

365-S. (Russian.) **Trilonometric Determination of Nickel in Copper Alloy.** I. I. Kalinichenko. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 266-267.

(S11; *Ni,* Cu)

366-S. (Russian.) **Continuous Measurement of Metal Temperatures in Laboratory Induction Furnaces.** P. Ya. Sorokin and S. V. Mikhailikov. *Zavodskaya Laboratoriya,* v. 24, Mar. 1958, p. 311-312.

(S16b, X24f, 1-69)

367-S. (Pamphlet.) **The Measurement of Thickness.** George Keinath. National Bureau of Standards Circular 585. Jan. 20, 1958, 79 p. $.50. (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

Physical parameters involved in the practical measurement of thickness, such as displacement, and general aspects of measurement, such as dynamic response. Methods treated in seven groups: mechanical, chemical, electrical, magnetic, optical, X-ray, and radioactive radiation; ranges, accuracy, advantages and limitations. (S14, X20)

368-S. (Book.) **Light Metals and Alloys B-7.** *American Society for Testing Materials,* 1958, 320 p. $3.75.

Ingots, castings, bars, rods, wire, shapes, forgings, pipes, tubes, sheet, plate, wrought products, filler metal and electroplating.
(S22; Al, Mg, Ti, EG-a39)

369-S. (Book.) **Metallic Electrical Conductors B-1.** *American Society for*

Testing Materials, 1958, 334 p. $3.75.

Covered are Cu, Cu alloys, Cu-covered steel, Al and galvanized steel and iron.
(S22, T1b; Al, Cu, Fe, ST, SGA-r)

T Metal Products and Parts

212-T. Stainless Steels for the Petroleum Industry. A Comparison of British and American Qualities. F. A. Kirk and J. Williams. *British Petroleum Equipment News,* v. 6, no. 3, 1957/1958, p. 40-46.

(T29n, 17-57; SS)

213-T. The Motor Coach and Aluminum. Leonard C. Rowe. *Corrosion,* v. 14, Apr. 1958, p. 163t-164t.

(T21d, 17-57; Al-f)

214-T. Use of High Strength Steel to Lighten Supersonic Aircraft. Bruce Mitchell. *Industrial Laboratories,* v. 9, Mar. 1958, p. 61-66.

High-strength steel can be used both for structural and nonstructural parts with savings in weight of more than 25% over past design with Al on Ti. This saving is possible because full strength of material can be used.
(T24, 17-57; ST, SGB-a)

215-T. Steel-Foil Corrugated Panels for Lightweight, High-Strength Structures. Bruce Mitchell. *Machine Design,* v. 30, Feb. 20, 1958, p. 179-181.

Use for airframes.
(T24a, 17-57; ST, 4-56)

216-T. 1958 Missile Materials Review. Alfred J. Zaehringer and Raymond M. Nolan. *Missiles and Rockets,* v. 3, Mar. 1958, p. 69-75.

Industry use and development of present and future materials.
(T24e; 17-57, SGA-h)

217-T. Aluminum: For Missiles in Production. Don Fabun. *Missiles and Rockets,* v. 3, Mar. 1958, p. 85-87.

(T24e, 17-57; Al-b)

218-T.* Metallurgical Problems in Fabrication of Zirconium-Clad Fuel Elements for Pressurized Water Reactors. R. B. Gordon. *Nuclear Science and Engineering,* v. 3, Mar. 1958, p. 232-249.

Fabrication of a variety of fuel materials which are compatible with Zr cladding. Homogeneity and melting crucible problems still exist with some of the fuel alloys. Zr-clad fuel elements of the bonded type are produced by pack rolling or coextrusion of the fuel and cladding. Unbonded fuel elements; dimensional control and welding. 5 ref. (T11g, 17-57, L22; Zr)

219-T. The Steel Sandwich. Howard S. Orr. *Pacific Factory,* v. 89, Mar. 1958, p. 48-52.

Production of thin stainless and alloy steels to meet light-weight needs of aircraft and missile construction. (T24a, 17-57; SS, 7-59)

220-T. For the Widest Variety of Industrial Jobs Use Powder Metallurgy Gears. *Powder Metallurgy Quarterly,* Spring 1958.

With new techniques, improved powders, sintering furnaces and presses, powder metallurgy is fast becoming a method of choice for producing heavy structural parts with close tolerances, high strength and shock resistance, at substantial cost savings.
(T7a, 17-57, H-general, 6-72)

221-T. Fasteners for Non-Ferrous Castings. *Precision Metal Molding,* v. 16, May 1958, p. 56-58.

Inserts, tapping screws, nuts, retaining rings and pins.
(T7f; 5-61, 5-63, EG-a38)

222-T. Germanium and Silicon Take the Lead Among Semiconductor Rectifiers. Raymond A. York. *Product Engineering, Design Edition,* v. 29, May 12, 1958, p. 89-91.

(T1, 17-57; Ge, Si)

223-T. Missile Production Requires New Techniques. Frank R. Swaney. *Tool Engineer,* v. 40, May 1958, p. 81-84.

Machining, welding and cleaning operations.
(T24e, G17, K-general, L-general)

224-T. A Brief Study of the Suitability of Titanium and a Titanium Alloy as Firewall Material. C. A. Hughes. Civil Aeronautics Administration. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131392, Sept. 1957, 10 p. $.50.

(T24a, Q-general, 2-62, 17-57; Ti)

225-T. Status of High-Strength Steels for the Aircraft Industry. R. J. Nekervis, C. H. Lund and A. M. Hall. Battelle Memorial Institute. *U. S. Office of Technical Services,* PB 121639, Jan. 1958, 106 p. $2.75.

(T24a, 17-57; ST, SGB-a)

226-T. Coiled Stainless Steel Tubing. Pt. 1, 2. J. J. Chmura, Jr., R. D. Stouffer, A. N. Winter, J. T. Hudson and L. F. Freitag. Martin Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131719, PB 131720, Dec. 1957, 2 v. 181 p. $4.

Seamless ¼-hard stainless steel best for coiled applications; instruction for designers in using metal tubing to solve problems requiring flexibility or relative motion in aircraft systems. (T24d, Q-general; SS, 4-60, 17-51, 17-57)

227-T. Space Age Materials Needs Await Metallurgy Progress. R. H. Thielemann. *Western Metalworking,* v. 16, Apr. 1958, p. 45.

(T24, SGA-h)

228-T. Corrosion Attack Target of Metal Development for Petrochemical Use. E. H. Edwards. *Western Metalworking,* v. 16, Apr. 1958, p. 49.

(T29m, 17-57, SGA-g)

229-T. Missile Braze Alloys Meet Wide Temperature Range. A. T. Cape. *Western Metalworking,* v. 16, Apr. 1958, p. 50-51.

(T24e, Q-general, 17-57; SGA-f)

230-T. Use of Low Grade Lead and Antimony in Acid Accumulators. M. A. Dasoyan. *Journal of Applied Chemistry of the USSR,* v. 29, no. 12, (1957), p. 1965-1978. (Translation by Consultants Bureau, Inc.)

Experiments show that impurities removed in refining are not only harmless but even useful in improving corrosion resistance of battery grids. 12 ref. (T1, 17-57, R6g; Pb)

231-T. (English.) **Structural Steelwork for the United States Pavilion at the 1958 Exhibition, Brussels.** Hans Hähl. *Acier Stahl Steel,* no. 2, 1958, p. 51-59.

(T26n, 17-57; ST)

232-T. (French.) **Copper and Brass in Contemporary American Architecture.** *Cuivres-Laitons-Alliages,* no. 42, Mar-Apr. 1958, p. 3-5.

(T26n, 17-57; Cu-b, Cu-n)

233-T. (French.) **Atomic Industry Metals: American Stainless Steels.** *Metallurgie et Construction Mecanique,* v. 90, Apr. 1958, p. 255-257.

Properties of metals used, slow neutron absorption, influence of alloying elements. (T11, 17-57; SS)

234-T. (French.) **High Pressure Vessel Strength.** R. Epain. *Metallurgie et Construction Mecanique,* v. 90, Apr. 1958, p. 263-271.

(Concluded.) (T26q, Q27)

235-T. (French and German.) **Use of Nonferrous Metals for Fire Truck Engines.** H. Vogt. *Pro-Metal,* no. 61, Feb. 1958, p. 926-929.

(T21b, T21e, 17-57; EG-a38)

236-T. (French and German.) **High-Quality Plumbing Hardware.** *Pro-Metal,* no. 61, Feb. 1958, p. 930-932.

(T6s, 17-57; Cu-n, Cu-s)

237-T. (French and German.) **Variety and Standardization of Brass Plumbing Hardware.** W. Baumann. *Pro-Metal,* no. 61, Feb. 1958, p. 947-948.

(T6s, S22; Cu-n)

238-T.* (German.) **Single Crystals and p-n Junction Crystals of Aluminum Antimonide.** Hans Achim Schell. *Zeitschrift für Metallkunde,* v. 49, Mar. 1958, p. 140-144.

Drawing of single crystals; drawing of p-n junctions. Physical properties of crystals; corrosion resistance; tempering and surface treatment. Application of crystals as rectifiers. (T1, 17-57, P15; Al, 14-61)

239-T. (Rumanian.) **Experimental Investigations on the Specific Properties of Rumanian Hard Metal-Ceramic Materials for Machining of Metals.** Elena Labusca and Nicolae Labusca. *Studii si Cercetari de Metalurgie,* v. 2, no. 1-2, 1957, p. 121-136.

9 ref. (T6n; 6-69, 6-70, SGA-j)

240-T. (Rumanian.) **Utilization of Nodular Graphite Castings for the Construction of Farm Machinery.** K. Stefanescu, V. Vines and L. Sofroni. *Studii si Cercetari de Metalurgie,* v. 2, no. 3, 1957, p. 321-336.

(T3, 17-57; CI-r)

241-T. (Rumanian.) **Improvement of the Process of Steel Railroad Tire Production at the Resita Metallurgical Combine.** R. Miculescu. *Studii si Cercetari de Metalurgie,* v. 2, no. 3, 1957, p. 351-360.

(T23p; ST)

242-T. The Heat Factor: Cutting Tool Temperatures, Ceramics Versus Carbides. N. H. Cook. *Automatic Machining,* v. 19, May 1958, p. 42-45.

(T6n, G17; 6-69, 6-70)

243-T. Survey Hot-Work Tool Steels for Aircraft and Missiles. R. J. Nekervis, C. H. Lund and A. M. Hall. *Iron Age,* v. 181, Mar. 6, 1958, p. 120-121.

(T24a, T24e, Q-general, 17-57; TS-k)

244-T. A 225,000 Psi. Steel. C. G. Mickelson and R. D. Engquist. *Mechanical Engineering,* v. 80, Apr. 1958, p. 70-71.

Wearpact: a complex low-alloy cast steel for mining equipment, using a minimum of critical materials; basic physical properties, such as density, thermal expansion and conductivity, specific heat, resistivity and others. Technical and economic advantages. (T28, 17-57, Q-general, P-general; AY)

245-T. Magnesium Makes Ground Heater Portable. *Modern Metals,* v. 14, May 1958, p. 42-43.

(T24e, 17-57; Mg-b)

246-T. Powder Metal Shanks Reduce Chatter. C. G. Erickson. *Tool Engineer,* v. 40, Mar. 1958, p. 107-109.

(T6n, 17-57; 6-72, 6-69)

247-T. (Italian.) **Applications of Nickel and Alloys Containing Nickel in Nuclear Power Plants.** *Nickel,* Feb. 1958, p. 1-8.

(T11, 17-57; Ni-b)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

248-T. (Japanese.) **Canning and Other Methods of Jacketing Reactor Fuel Elements.** K. Ono and T. Hancho. *Metals,* v. 28, Apr. 1958, p. 279-283.

11 ref. (T11g)

249-T.* **Special Steels in the Atomic Industry.** *Aciers Fins & Speciaux,* no. 28, Mar. 1958, p. 40-45.

Application and properties of AISI 347, 318, 304 and other steels in nuclear reactor components. (T11, 17-57; SS)

250-T. Meeting the Requirements of a Modern Industry. *Edgar Allen News,* v. 36, Nov. 1957, p. 244-246.

Molds for plastics. (T29s, 17-57; ST)

251-T. Behavior of Bearings Made of High Temperature Materials. Arthur S. Irwin. *Society of Automotive Engineers,* v. 17D, Jan. 1958, 3 p.

(T7d, 17-57; ST, SGA-h)

252-T. (Book.) **Aluminum in Modern Architecture.** 118 p. 1958 Ed. Reynolds Metals Co., Louisville, Ky.

Use of Al in 26 recent buildings in different parts of the world. Architectural application of anodized Al; anodizing practice including preliminary mechanical finishing, cleaning, etching, chemical brightening, anodizing, neutralizing, coloring and sealing. (T26n, 17-57, L19; Al)

W Plant Equipment

259-W. Transformers for Electric Furnaces. William M. Bogert. *Blast Furnace and Steel Plant,* v. 46, Apr. 1958, p. 377-378, 388.

(W18s, W11r, 1-52)

260-W.* **Heat-Exhangers.** E. Longden. *British Foundryman,* v. 51, Apr. 1958, p. 193-197.

Hot blast cupola-type furnaces allow more precise control of metal; increased efficiency derived from the use of heat-exchangers; two designs described. (W13b, W18d, 1-52)

261-W. Cold Rolling Mill for Very Thin Strip. *Engineer,* v. 205, Feb. 21, 1958, p. 272-274.

Use of an ordinary two-high rolling mill with a simple insert mill to roll nickel-iron tapes. (W23f; 4-53)

262-W. Ductile Iron in the Machine Tool Industry. Robert M. Bronson. *Inco,* v. 27, Apr. 1958, p. 11-15.

Mechanical properties, endurance, strength and rigidity, machinability, wear resistance, pressure tightness and flexibility of design. (W25, 17-57; Q-general; CI-r)

263-W. Assessment of Heating Requirements for Metal Finishing Process Tanks. H. G. Hickman. *Metal Finishing,* v. 4, Apr. 1958, p. 123-126.

(W3j, S16, L12, L17a)

264-W. Rolling Mill Drives. Some Recent Electrical Installations. *Metallurgia,* v. 57, Apr. 1958, p. 189-192.

(W23n, 1-52)

265-W. Process Controls for Making Turbine Castings. *Mechanical Engineering,* v. 80, Apr, 1958, p. 61-63.

(W11n, 17-57; 5-60)

266-W. British Nuclear Energy Developments. John Cockroft. Digest of paper presented at meeting of Dutch Engineering Society, Feb. 1957. *Metal Progress,* v. 73, May 1958, p. 140-144.

Theory and practice underlying the United Kingdom Calder Hall nuclear power station and the Dounreay reactor. (W11p)

267-W. Titanium-Tipped Anodizing Work Racks Require No Stripping. *Products Finishing,* v. 22, May 1958, p. 74, 76, 78.

Titanium work holders mounted on Al work racks. Ti is not affected by the anodic process, its surface conductivity remains constant, and no "stripping" between loads is necessary. (W3g, 17-57; Ti)

268-W. Snap Hearth Unit Cuts Manhours, Fuel Costs on Small Parts. Leo Wartenberg. *Western Metalworking,* v. 16, Apr. 1958, p. 57-58.

Snap hearth furnaces for mechanized heat treating of small parts. (W27p, 1-52)

269-W. Use of Carbonaceous Refractories in Bottom and Wall of Hearth of Blast Furnaces. P. I. Lokshin and G. P. Moshkina. *Stal',* v. 16, no. 2, 1956, p. 108-114. (Henry Brutcher, Altadena, Calif., Translation no. 3875.)

(W17g; RM-h39)

270-W. Experience Gained in Many Years of Operating a Hot-Metal Mixer. G. N. Susakin. *Stal',* v. 16, no. 5, 1956, p. 465-467. (Henry Brutcher, Altadena, Calif., Translation no. 4018.)

Transfer ladle design developed for minimum heat losses and skulling. (W18n, 1-52; ST)

271-W. Molten Metals or Alloys as Heat Treating Media for Steel. A. P. Garashchenko, A. P. Gulyaev and Z. S. Luneva. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1958, p. 21-24. (Henry Brutcher, Altadena, Calif., Translation no. 4119.)

Aluminum and its alloys as substitutes for toxic and much more expensive Pb baths for the heat treating of steel. (W28p, 17-57; ST, Al, 14-60)

272-W. Basics of Development for Crane Bridges. Karl Eckinger. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 15-23. (Iron and Steel Institute Translation no. 922.)

Previously abstracted from original. See item 105-W, 1957. (W12q, 17-57, Q1, 1-54; ST)

273-W. Torsion-Proof Box-Girders in the Construction of Mill Cranes. Heinz Schwarz. *Stahl und Eisen,* v. 77, Jan. 10, 1957, p. 24-32. (Iron and Steel Institute Translation no. 923.)

Previously abstracted from original. See item 106-W, 1957. (W12q, 17-57, 17-51; ST)

274-W. (English.) **Nodular Cast Iron Piston Rings With a Ferritic Matrix.** Traian Dumitrescu and Pascal Popescu. *Revue de Métallurgie (Bucarest),* v. 2, 1957, p. 83-90.

Nodular iron piston rings have a number of advantages, such as greater elasticity, absence of internal stresses, resistance to wear, and others, over those of cast iron alloyed with Cr, Ni, Mo and W. 9 ref. (W11j; CI-r, 17-57)

275-W. (French.) **Contribution to the Study of Rolling Mill Equipment. Pt. 2. Rolling Mills. V. Bar Mills and Merchant Mills.** G. Grenier. *Echo des Mines,* no. 3514, Mar. 1958, p. 159-160.

(To be continued.) (W23d, 1-52)

276-W. (French.) **Foundry Equipment and Layout.** *Journal d'Informations Technique des Industries de la Fonderie,* no. 93, Jan-Feb. 1958, p. 9-11.

(W19, 1-52, 18-67)

277-W. (German.) **Ingot Mold Dryer With Hot Air Circulation.** *Werkstatt und Betrieb,* v. 91, May 1958, p. 242.

New gas-heated dryer for foundry work. (W19k, 1-52)

278-W. (Russian.) **Automatic Heat Control of Hot Blast Stoves.** L. V. Brodetzkii and P. G. Pikalov. *Stal',* Jan. 1958, p. 21-22.

(W17g)

279-W. (Russian.) **Increasing Lining Life in Electric Furnaces.** O. F. Antropov and N. V. Sidorov. *Stal',* Jan. 1958, p. 48-49.

(W17j; RM-h)

280-W.* (Russian.) **Improved Annealing of Structural Steel in Mechanically Charged Batch Furnaces.** M. I. Kolosov, I. Ya. Aizenshtok and A. I. Komissarov. *Stal',* Jan. 1958, p. 71-74.

Batch furnaces with mechanical charging of piles for annealing structural steel have higher production rate than those with slide-hearths. They have combustion chambers under the hearths and auxiliary apertures for recirculating hot gases. Fuel economy, prevention of local overheating, and uniform heating of the charge are some of the advantages. (W27, 1-62, J23; ST)

281-W. (Russian.) **New Rolling Mills in England.** A. I. Tselikov and A. A. Korolev. *Vestnik Mashinostroeniya* Mar. 1958, p. 72-77.

(W23)

282-W. (Spanish.) **Electrical Equipment Used in Continuous Rolling of Silicon Strip.** G. J. Hay and H. S. Fegely. Paper from *Second National Congress of the Steel Industry,* Mar. 1957, p. 111-127.

Technique used in process; tensile stress, velocity and temperature used; a 1000-kva. and 6600-volt electric furnace controlled by magnetic amplifier regulator; results obtained. (W23c, W23n, 1-52, AY, *Si*)

283-W. (Spanish.) **Rectifier Characteristics and Application in Steel Industry.** J. R. Moran. Paper from *Second National Congress of the Steel Industry,* Mar. 1957, p. 153-181.

Mercury rectifier; advantages and disadvantages; costs and comparison with the motor generator type; choice on basis of initial and operating cost and power supply. Constant and adjustable voltage regulators; copper oxide, selenium and germanium rectifiers; applications. (W11q, 1-52; ST)

284-W. (Spanish.) **Operation of a Rolling Mill With Modernized Electric Controls.** E. B. Fitzgerald and Eric Pell. Paper from *Second National Congress of the Steel Industry,* Mar. 1957, p. 233-246.

(W23n, 1-52; ST)

285-W. (Spanish.) **Basic Materials Used in Openhearth Furnace Construction and Maintenance.** Guillermo Gomez Colmenares. Paper from *Second National Congress of the Steel Industry,* Mar. 1957, p. 247-249.

(W18r, 1-57; ST)

286-W. (Spanish.) **Secondary Reactances in Electric Arc Furnace Circuits.** Raymond Arias. Paper from *Second National Congress of the Steel Industry,* Mar. 1957, p. 271-273.

(W18s, 1-52; ST)

287-W. Lubrication in Rolling Mills. New Designs for Maximum Efficiency. S. L. Norton. *Iron and Coal Trades Review,* v. 175, Nov. 8, 1957, p. 1097-1098.

(W23, 17-51, 18-73)

288-W. Mechanical Handling Equipment for Motor Car Body Stampings.

J. Nieminen. *Machinery (London)*, v. 92, Feb. 28, 1958, p. 478-481.
(W12, G3, T21a; ST, 4-53)

289-W. Induction Heating. A. Dixon. *Tool Engineer*, v. 40, Mar. 1958, p. 84-86.
Development of flexible cables and lightweight induction coils makes portable units possible for brazing and selective heating. (W28s, W29n)

290-W.* (German.) **Energy Absorption of a Graphite Bar and Current Consumption of Graphite Bar Furnace.** Karl Wagner. *Giesserei*, v. 45, Mar. 27, 1958, p. 173-175.
Course of energy absorption during melting. Most important factor influencing total monthly current consumption is weight of single charge. Maximal furnace capacity must be fully used. (W18s, 16-61)

291-W. (Italian.) **Theory of the Cupola Furnace.** W. Patterson. *Fonderia*, v. 7, Jan. 1958, p. 13-19.
Static picture of the cupola furnace. The dynamic process, behavior of the iron, of the coke, and of the combustion air. Theoretical possibilities of influencing the melt. (W18d, E10a)

292-W. (Russian.) **Modernization of Equipment in Sheet Mills.** A. P. Koshka and V. A. Brusilovskii. *Metallurg*, v. 3, Mar. 1958, p. 27-28.
(W23c, 18-74; ST)

293-W.* The Use of Heat Resisting Steels in the Construction of High-Temperature Heat Exchangers. *Aciers Fins & Speciaux*, no. 28, Mar. 1958, p. 65-70.
Steels used most frequently contain 5% Cr, 0.5% Mo; 7% Cr, 0.5% Mo, 0.3% V; 13% Cr, 1.5% Si; 24% Cr, 1.8% Si; 25% Cr, 20% Ni; carbon content of these steels is systematically kept low, about 0.10 to 0.12%. Stainless steels of 18-8 type and steel containing 25% Cr and 12% Ni are sometimes used.
(W13b, 17-57; SS, SGA-h)

294-W. High-Boron Steels for Nuclear Reactors. *Australasian Manufacturer*, v. 43, Apr. 26, 1958, p. 54-62.
(W11p, Q-general, 17-57; AY, *B*)

295-W. Tests on a Four-High Reversing Cold Strip Mill. Obering H. Bischoff and K. H. Spiller. *Demag News*, no. 145, 1956, p. 17-22.
Power requirements, strip tension, roll forces and gage variations.
(W23c)

296-W. Modern Four-High Universal Reversing Mill for Heavy and Medium Plate. W. Mullenbach. *Demag News*, no. 146, 1956, p. 25-33.
(W23b)

297-W. Metallurgy Makes the Difference. Fred G. Sefing. *Diesel Power*, v. 35, Nov. 1957, p. 35-39.
Role of metallurgist in quenching temperature and pressure problems in high output engines.
(W11j, 17-57; SGA-h)

298-W. Wire Rod Mill Layout. *Wire Industry*, v. 25, May 1958, p. 469-470.
Small mill rolling angle irons and T-sections as well as wire rods.
(W23d, 18-67)

299-W. Design and Performance of Hydraulic Descaling Plants. Wolfgang Berns. *Stahl und Eisen*, v. 77, May 2, 1957, p. 567-576. (Iron and Steel Institute Translation no. 542.)
Previously abstracted from original. See item 210-W, 1957.
(W23, 1-72, L10g)

300-W. New Methods of Hot Cooling. Rudolf Vonnemann. *Stahl und Eisen*, v. 77, Aug. 22, 1957, p. 1126-1134. (Iron and Steel Institute Translation no. 684.)
Previously abstracted from original. See item 14-W, 1958.
(W10f, 1-52)

301-W. Location of Blast-Furnace Mixing Valve. N. Chernov. *Stal'*, May 1957, p. 389-391. (Iron and Steel Institute Translation no. 690.)
Previously abstracted from original. See item 4-W, 1958.
(W17g, 1-52; RM-h, Fe)

302-W. Possibilities of Standardizing the Drives of Steelworks Cranes. Albrecht Wolf. *Stahl und Eisen*, v. 77, Jan. 10, 1957, p. 33-36. (Iron and Steel Institute Translation no. 798.)
Previously abstracted from original. See item 107-W, 1957.
(W12q, 17-57, T7; ST)

303-W. The Hydrocyclone as Part of the Water Circulation System in an Integrated Steelworks. Alfred Kohler. *Stahl und Eisen*, v. 78, Feb. 20, 1958, p. 235-239. (Iron and Steel Institute Translation no. 893.)
Previously abstracted from original. See item 172-W, 1958.
(W10h, ST)

304-W. The Full Continuous Strip Mill of Messrs. Wuppermann. Heinrich Lampmann. *Stahl und Eisen*, v. 78, Feb. 6, 1958, p. 160-167. (Iron and Steel Institute Translation no. 899.)
Previously abstracted from original. See item 155-W, 1958.
(W23c, F23, 1-61)

305-W. (French.) **The Atomic Age Presents Steel With a Challenge.** Edward A. Livingstone. *Metallurgie et la Construction Mecanique*, v. 90, May 1958, p. 361-363, 365, 367, 369.
(W11p, 17-57; ST)

306-W. (German.) **Austenitic Steel Castings for the Construction of Gas and Steam Turbines.** W. Stauffer and A. Keller. *Giesserei*, v. 45, Apr. 1958, p. 229-239.
5 ref.
(W11k, W11m, 17-57, Q23, SS-e, 5-60)

307-W. (German.) **Nonoxidizing Hardening Furnace for High Speed Steel Tools.** N. K. Koebel. *Werkstatt und Betrieb*, v. 91, Apr. 1958, p. 171-172.
Preheating, high-temperature and quenching stages combined into one unit. (W27n, J26; TS)

308-W. (German.) **New Metal-Bonded Diamond Grinding Wheel.** *Werkstatt und Betrieb*, v. 91, Apr. 1958.
(W25c)

309-W. (German.) **A Cutting Torch for Maximum Cutting Powers for Extremely Thick Workpieces.** *Werkstatt und Betrieb*, v. 91, Apr. 1958.
(W29d, G22g)

310-W. (German.) **Easy Portable Open-Type Mold Drying Oven.** *Werkstatt und Betrieb*, v. 91, Apr. 1958.
(W19k)

311-W. (Russian.) **Pneumatic Conveyors for Molding Mixtures.** V. M. Korchemkin, Yu. O. Rapoport and A. A. Gaidukov. *Liteinoe Proizvodstvo*, v. 2, Feb. 1958, p. 12-13.
(W19h)

312-W. (Russian.) **Durability of Unburned Magnesite-Chromite Bricks in Openhearth Roofs.** E. M. Tsygankov and M. F. Ratnikov. *Stal'*, v. 18, Apr. 1958, p. 317-319.
(W18r; RM-h)

X Instrumentation
Laboratory and Control Equipment

40-X. Autographic Stress-Strain Recorders. Raymond R. Bouche and Douglas R. Tate. *ASTM Bulletin*, no. 228, Feb. 1958, p. 33-42.
93 ref. (X29q)

41-X. Strain Stress Computer. Thomas S. DeSisto and David E. Driscoll. *ASTM Bulletin*, no. 228, Feb. 1958, p. 46-49.
(X29q)

42-X.* A New Dynamic Test Facility for Aqueous Corrosion Studies. S. Greenberg, J. E. Draley and W. E. Ruther. *Corrosion*, v. 14, Apr. 1958, p. 191t-192t.
New high-pressure, high-temperature dynamic aqueous corrosion test loop. Maximum operating conditions are 360° C., 3000 psi., 20 to 30 ft. per sec. velocity. Design allows flexibility of operation and precise control of corroded composition.
(X1c, R4)

43-X. Apparatus for Determination of Hydrogen in Steel. Lars Bjerkerud. *Jernkontorets Annaler*, v. 141, no. 2, 1957, p. 90-94. (Iron and Steel Institute Translation no. 613.)
Previously abstracted from original. See item 49-X, 1957.
(X21, 1-2, S11; ST, *H*)

44-X. (German.) **Foil Thickness Meter.** W. Hellwig. *Aluminium*, v. 34, Apr. 1958, p. 206-207.
Two meters, one for thick strip and the other for foil make contact with the stock and convert mechanical changes into electrical signals which are recorded.
(X20c, S14c, F23, 4-56)

45-X. (Russian.) **More Efficient Calibration of Hexahedral Rolled Steel.** A. A. Nefedov and B. M. Ilyukovich. *Metallurg*, v. 3, Mar. 1958, p. 22-24.
(X20, W23; ST)

46-X. (Russian.) **New Machines for Testing Strength of Metals.** B. A. Avdeev. *Zavodskaya Laboratoriya*, v. 24, Feb. 1958, p. 253-254.
(X29, 1-52, Q27)

47-X. Apparatus for Measuring the Depth of Cracks. Lutz Brand. *Stahl und Eisen*, v. 77, May 2, 1957, p. 576-581. (Iron and Steel Institute, Translation no. 621.)
Previously abstracted from original. See item 53-X, 1957.
(X8, 1-52, 9-72)

48-X.* (German.) **Measurement of X-Ray Interference Curves With the Scintillation Counter.** Hermann Moller and Friedhelm Brasse. *Archiv für das Eisenhüttenwesen*, v. 28, Dec. 1957, p. 831-837.
Tests with the scintillation counter for the measurement of intensities in X-ray interference lines resulted in considerable advantages over the conventional Geiger-Mueller counter. The efficiency was ten times higher, permitting three times higher counting accuracy. A differential discriminator provided for the suppression of cosmic rays and of the impulses emitted from the secondary electron amplifier. 19 ref. (X2c)

(*)Articles Available Through Photocopy Service; See Coupon, p. 75.

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PHYSICAL, POWDER METALLURGISTS
Required For
Challenging Research Assignments

A Senior Physical Metallurgist, preferably with Ph.D. and several years of experience is required for research work in phase diagram and isothermal transformation studies in addition to applying physical and metallurgical principles to the casting of metals, alloy development and fracture studies. Clear analytical thinking and articulate writing ability are essential requisites for this position.

A Junior Physical Metallurgist with B.S. degree and some experience or an outstanding recent graduate with excellent understanding of physical metallurgy applications plus a background in Physics or Physical Chemistry to perform phase diagram and isothermal transformation studies, investigation of fatigue and fracture, and nucleation processes.

An experienced Powder Metallurgist or an outstanding recent graduate (B.S. to Ph.D.) with outstanding background in the basic sciences and some graduate metals studies is required for a challenging Powder Metallurgy Assignment. Must have previous training or strong interest in doing work in dispersed phase activities, high temperature alloys, fiber metallurgy, cermets or nuclear fuel elements. Additional background in production of friction materials or parts helpful.

These are permanent assignments which offer an exceptional opportunity to the creative individual who desires to work on stimulating and diversified research programs which challenge the imagination and provide unusual opportunity for professional growth. We are a progressive, independent research organization offering competitive salaries, unusual freedom of activity, optimum professional associations and liberal benefits which include tuition free graduate study, outstanding vacation program, and generous relocation allowance.

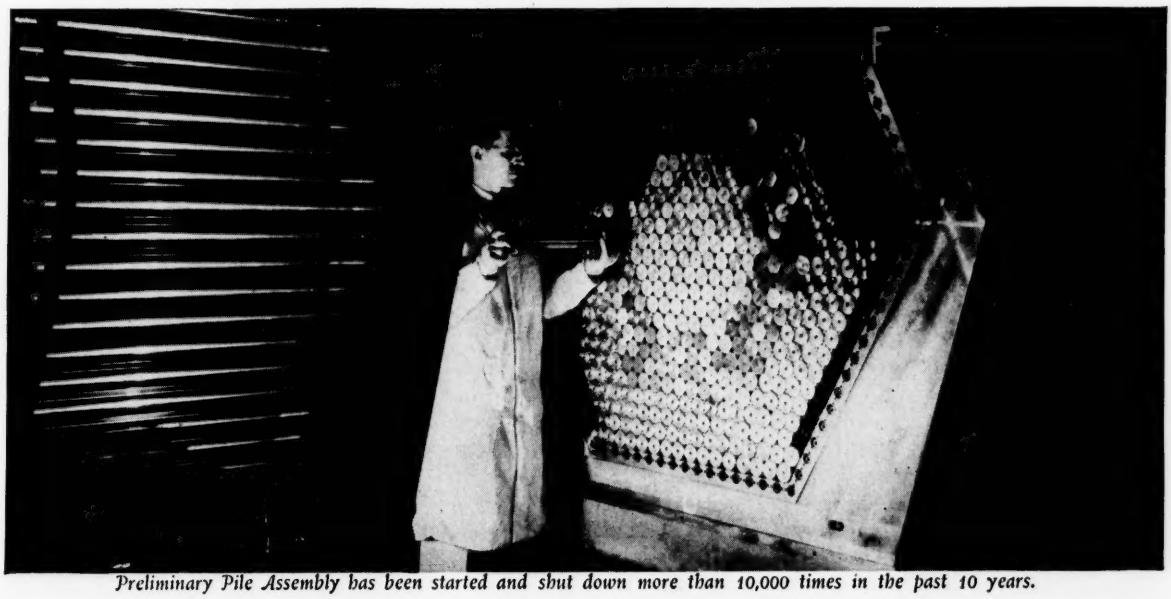
SEND COMPLETE RESUME TO:
A. J. Paneral

ARMOUR RESEARCH FOUNDATION
OF ILLINOIS INSTITUTE OF TECHNOLOGY
10 WEST 35TH STREET CHICAGO 16, ILLINOIS

furthering creative technology at

The KNOLLS ATOMIC POWER LABORATORY

To men concerned with pushing back the frontiers of reactor technology, the many facilities for fundamental and applied research at KAPL hold a special interest. Among the unique critical assemblies for experimental purposes is the PPA, *pictured below.* This Preliminary Pile Assembly can be shut down and restarted in 15 minutes in order to rearrange fuel elements to simulate different reactor designs. Only last year two new buildings were completed to house two additional experimental reactors, a 704 computer, and to provide modern office facilities for an enlarged mathematical staff.



Preliminary Pile Assembly has been started and shut down more than 10,000 times in the past 10 years.

NEW SCIENTIFIC AND ENGINEERING POSITIONS ARE NOW OPEN IN ADVANCED NUCLEAR DEVELOPMENT AND DESIGN OF NAVAL PROPULSION SYSTEMS

If you want the stimulation of working toward the solution of increasingly complex nuclear power plant problems in a laboratory atmosphere, The Knolls Atomic Power Laboratory welcomes your inquiries. Current openings are listed below. Degree required; advanced degree and/or related experience preferred.

CHEMICAL ANALYSIS, REACTOR MATERIALS & PROCESSES
DYNAMIC FLOW CORROSION TECHNOLOGY
RADIOCHEMISTRY AND INSTRUMENTATION
REACTOR CORE STRUCTURAL FABRICATION
METALLURGICAL & MANUFACTURING PROCESSES DEVELOPMENT
REACTOR MATERIALS APPLICATION

U. S. CITIZENSHIP REQUIRED.

If you can qualify, send letter giving details in confidence to: Mr. A. J. Scipione, Dept. 41-MS

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leading reactor builder offers

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EXPERIENCED NUCLEAR ENGINEERS

ANALYTICAL

Degree essential. Experience as required.

Preliminary Engineering: Conduct preliminary analysis and design of overall power reactor systems and components.

Core Analysis: Includes criticality, temperature, void and power coefficients, control effectiveness and fuel cycles.

Shielding Analysis: Advanced studies and analysis on stationary and mobile plants.

Heat Transfer and Fluid Flow: Steady-state and transient analysis. Includes power optimization studies, free and forced convection flow transients, boiling, and two phase flow. Advanced analytical methods using analog and digital computers.

Stress Analysis: Structural, thermal, and dynamic stress analysis of high temperature reactor systems.

Systems Analysis: Coordinate engineering on reactor plant design.

Control Analysis: Reactor kinetics and overall nuclear power plant control – hazard analysis – analog and digital computers.

Operations: Foreign and domestic – for check-out, start-up and customer training. Includes operational analysis and design criteria.

DEVELOPMENTAL

Requires related experience and applicable degree.

Fuel Elements: Experienced senior physical metallurgists for responsible positions in nuclear reactor fuel development programs. Includes studies of radiation effects, overall evaluation of uranium and thorium alloy, and ceramics. Also metallurgical engineers for mechanical fabrication development for these materials.

Mechanical Components: Experienced mechanical engineers for the development of coolant and other equipment for power reactors. Stimulating developmental problems in thermodynamics, stress, heat transfer and fluid dynamics. Senior metallurgists for responsible research positions on reactor structural materials. Desire alloy development and solid state diffusion experience.

Instrumentation and Control: Senior physicists and EE's for design and development of advanced design transistor, vacuum tube, and/or magnetic amplifier control and instrumentation components.

DESIGN

Senior opening. Degree required. Nuclear experience essential.

Process Instrumentation: Reactor, auxiliary, and control systems.

Facilities: Mechanical systems.

Process Systems and Equipment: Pumps, heat transfer equipment.

Electrical: Reactor control and power systems.

Machine Design: Heavy mechanical.

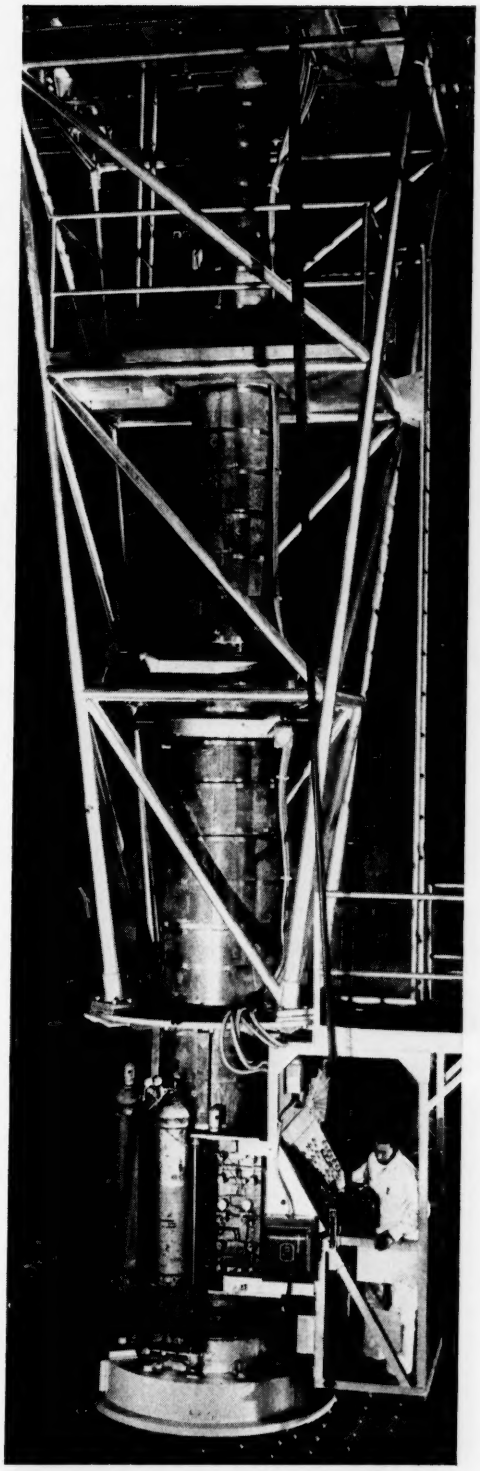
Reactor Core Components: Moderator cans, fuel elements, core supporting structures.

Control Mechanisms: Control and safety rods, drives and allied tooling.

Other opportunities in:
Reactor Theory, Experimental Neutron Physics,
Solid State Physics, and Reactor Kinetics.

Write for more details of exciting career opportunities at AI.
Mr. D. G. Newton, Personnel Office, Atomics International,
15330 Raymer Street, Van Nuys, California.
(In the suburban San Fernando Valley, near Los Angeles)

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION, INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM

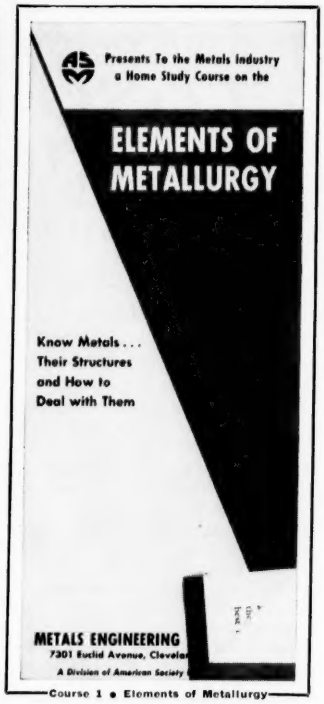


SRE Fuel Handling Cask. The Sodium Reactor Experiment and the Organic Moderated Reactor Experiment are both in successful operation. Plans for several central station plants based on these experimental power reactors are underway. AI is also conducting an advanced power reactor study for Southwest Atomic Energy Associates. Overseas, AI has already sold 5 reactors, and is affiliated with ASEA of Sweden and the new company INTERATOM (with DEMAG, West Germany).

Course 16 • High Temperature Metals

PICK THE FOLDER THAT INTERESTS YOU

Course 18 • Stainless Steels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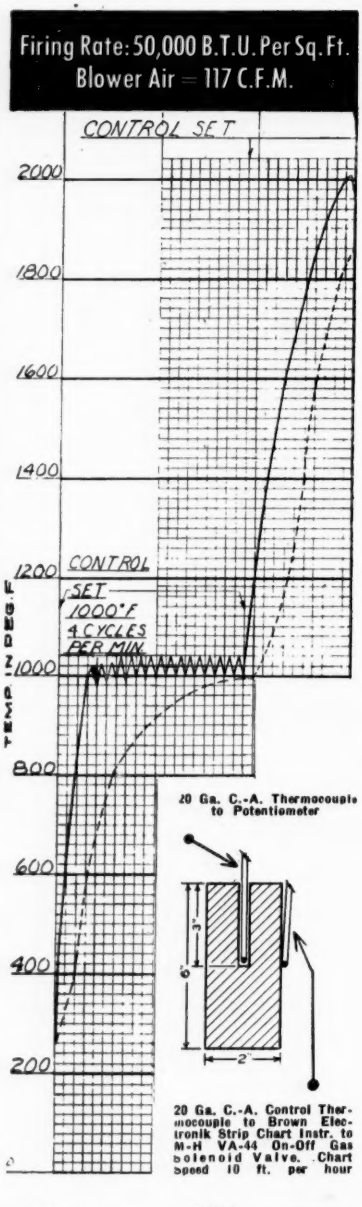
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Blower Air = 117 C.F.M.
CONTROL SET
2000
1800
1600
1400
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1000
800
600
400
200
TEMP IN DEG F
20 Ga. C.-A. Thermocouple to Potentiometer
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Low Thermal Storage

A POSITIVE SOURCE OF RADIATION, TRANSFERRING MAXIMUM AMOUNT OF HEAT DIRECTLY TO THE WORK WITH NEGLIGIBLE THERMAL STORAGE IN THE FURNACE STRUCTURE. THIS MEANS RAPID STARTING, RAPID COOLING AND RAPID RE-STARTING

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A TYPICAL EXAMPLE OF RAPID HEATING IS SHOWN ON THE GRAPH (Left). FIRING 50,000 BTU PER SQ. FT. THE FOLLOWING TEMPERATURES WERE OBTAINED—

1. Up to 1000° F. (10 min. lag 800 to 1000° F.)
2. Up to 1975° F. (3 min. lag)
3. 1975° F. to 2275° F. (3 min. lag)

CONVERSELY, THE REFRACTORY WALL HAS NO HEAT STORAGE SO WHEN GAS IS SHUT OFF AND AIR ALLOWED TO BLOW THROUGH FURNACE WALL, THE WALL IMMEDIATELY ASSUMES TEMPERATURE OF INCOMING AMBIENT AIR.

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